JPRS-UFM-87-007
18 SEPTEMBER 1987

FOREIGN
BROADCAST
INFORMATION
SERVICE

JPRS Report

Soviet Union

FOREIGN MILITARY REVIEW

No 5, May 1987

54

JPRS-UFM-87-007

18 SEPTEMBER 1987

SOVIET UNION

FOREIGN MILITARY REVIEW

No 5, May 1987

[Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal ZARUBEZHNOYE VOYENNOYE OBOZRENIYE published in Moscow by the Ministry of Defense.]

CONTENTS

New Chief of the General Staff of the Israeli Armed Forces
(Unattributed) (not translated)

FOREIGN MILITARY CHRONICLE (pp 79-80) (Unattributed) (not translated)

COLOR INSERTS (not reproduced)

- West German Jaguar-2 Self-Propelled Antitank Missile System
- American SH-60B SeaHawk ASW Helicopter
- Japanese Destroyer-Escort DDK114 Makigumo
- American SR-71A High-Altitude Supersonic Strategic Reconnaissance Aircraft

12821
CSO: 1801/201

SOCIO-POLITICAL ASPECTS OF CONTEMPORARY U.S. MILITARY DOCTRINE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 7-13

[Article by Capt 1st Rank N. Vinogradov under the rubric "General Problems, Armed Forces": "Socio-Political Aspects of Contemporary U.S. Military Doctrine"]

[Text] Military doctrine is understood to mean the system of views of the essence, goals and nature of possible warfare, the country's preparation for it and the armed forces capable of waging it that is accepted in a state at a given time. Military doctrine is in its essence the concentrated expression of the most common and fundamental ideas and principles of the military policy of the state. It is developed in the channel of the latter and contains the data essential for practical activity taken from the whole system of knowledge of war and armies. It is namely through military doctrine that the military and political views of the class in power are realized.

The provisions of military doctrine are brought about by the actually existing objective conditions, and first and foremost the social structure of the state, its domestic and foreign policy, the ideology of the ruling class, socio-political, economic and geographical conditions and the level of development of science and technology, including military science and military arts. The views of the probable adversary are also taken into account herein.

Socio-political factors have a decisive effect on the formation of military doctrine. The doctrine of the state is the same as its social nature and the policies reigning in its ideology. It is always of a class nature and reflects the economic and, accordingly, socio-political interests of the class that rules the state.

The structure of the social essence of warfare, the principal elements of which are a definite policy and its continuation in a specific form--the form of armed violence--is predetermined by two closely associated and mutually conditioned aspects of military doctrine--the socio-political and technical military ones. The former reveals the attitude of the ruling class toward war, its political goals and tasks in a future war and the principal directions for preparing the country and the armed forces for it; the latter encompasses questions of immediate military construction, the technical

equipping of the armed forces and their training and the determination of the forms and methods of waging operations and warfare by the armed forces overall.

In considering the military doctrine of the United States in light of these positions, it should be noted that there is no precise definition of the term "military doctrine" in American military and political-military literature or official publications. If it is even used by the authors, it is usually equated with the concepts of "military policy," "military strategy" or "grand strategy." The term "doctrine" as widely used in official American publications only partially encompasses its technical military aspect in substance. This does not signify, however, that military doctrine does not objectively exist in the United States. The substance of it is reflected in many official documents, as well as in the practical activity of the military and political leadership of the United States. In this article, I will dwell first and foremost on the principal socio-political aspects of the doctrine.[1]

In uncovering the socio-political substance of American military doctrine, it should be determined what views toward armed force and war overall, its causes, essence and place in intergovernmental relations are currently accepted my the military and political leadership of the United States.

The views of American bourgeois ideologists adhering to different streams of thought have been laid at the foundation of the formation of these views, depicting history in the form of a disorderly coupling of events, conflicts, and wars, deliberately absolutizing the role of force in the historical development and mechanically transfering military experience of the past to modern times. They have declared force to be "a law of history" and its deciding factor in the past, present and future. They treat war either as an ineradicable biological phenomenon that is borne in the genes of people, or as a psychological phenomenon engendered by the nature of man inclined, they say, to violence. The true cause of war and armed clashes in modern times--imperialism--is herein screened, while responsibility for the appearance of conflicts is dumped onto an abstract man.

In their view, war is the product of constant tensions that arise in the struggle for power, hegemony, the result of the intellectual calculations of people who extract advantage from political experience, an inevitable and effective means of regulating the number of people on earth. All of these diverse conceptions (sociological, biological, psychological, technocratic etc.), perpetuating and legitimizing a policy of aggression, are aimed at justifying war, distorting its true essence and veiling its true socio-economic and political class origins and causes.

It is namely such reactionary and aggressive views that comprise the ideological basis of the doctrine of "neoglobalism" and the strategy of "direct confrontation" that was proclaimed by the Reagan administration at the beginning of the 1980s, the strategic conceptions of "nuclear first strike," "limited nuclear warfare," "protracted nuclear war" and many others. In accordance with these views, American military doctrine contains principles of carrying out policy "from a position of strength," the creation of new aggressive militaristic blocs and the expansion of existing ones, the

implementation of U.S. military presence in any regions they arbitrarily declare zones of "vital interest" to them and preparations for nuclear war and possible victory in it.

It is namely these views of American bourgeois ideologists that facilitate the adaptation of the military machine of the United States to the political purposes of the ruling class and are a distinctive form of expression of the interests of the MPC [military-political complex], serving as the ideological foundation and theoretical grounding for the basic tenets of American military doctrine.

The contemporary military doctrine of the United States proceeds from the following positions: war is eternal and inevitable, while peace is just a phase for preparing for it; force is the deciding factor of historical development, while military coercion is the sole effective means of solving the cardinal problems of intergovernmental relations; and, the causes of war are concealed in the physiology and psyche of people and the endless struggle for survival and unknowable phenomena of everyday human existence.

These underlying ideological principles, reflecting the views of the extreme rightist reactionary circles, are fixed in a multitude of official documents that define the directions of construction of the armed forces and their use as a tool for the achievement of political goals, as well as measures for the preparation of the country for war overall. Thus, it is asserted in one of the charters of the U.S. Army that war in the conventional sense is the extreme expression of irreconcilable political views or goals, be they international, national or semi-national, while in a narrow sense is a clash between the armed forces of opposing sides. It is further emphasized that the need for armed forces to ensure and defend the interests of the United States is based on the fact that conflict or the probability of the appearance of conflict is characteristic of the mutual relations of people and nations. The United States should be ready to employ the armed component of its might in any type of conflict, including nuclear war.

A substantive element of American military doctrine that reveals its aggressive essence and reactionary thrust are the positions concerning the political goals of the United States in wars and military conflicts, for the unleashing and waging of which they are preparing so persistently. It should be noted herein that in many official foreign sources, the objective link of war and politics is either not mentioned or is covered up. Sometimes mention is encountered of the fact that the goals of war arise directly from the policies of the state. As a rule, however, the goals of wars and armed conflicts are deliberately limited to military victory, that is, the routing of the armed forces of the adversary. The provisions of the U.S. Army charter thus indicate that "the strategic goal of war is derived from political goals and should provide for the application of military resources essential for the achievement of the political intentions for the sake of which the war is being waged. If the political result of the war should become the complete defeat of the enemy, then the military goal, most probably, is the routing of his armed forces and crushing the will of the enemy to resist." This provision of the charter confirms that wars and armed conflicts are unleashed and waged by

internationalist circles for the sake of realizing "political intentions," but remains silent on what the true substance of these intentions is.

The political goals of the ruling class, the achievement of which is planned with the aid of armed force, are camouflaged by a multitude of neutral, seemingly inoffensive and jingoistic terms such as "ensuring national security," "protecting the vital interests of the United States," "restraining the aggressor," "resolving international conflict" and others. "The ultimate goal of war," notes one of the charters of the Air Force, "consists of neutralizing or destroying the armed forces of the enemy and breaking his will to continue the fight." It is asserted in a textbook for those attending the American War College, which spells out the basic provisions of military arts, that "The goal of war is to impose your will on the enemy. In the face of a coincidence of the chief political goals of the rival sides, the state opposite to war--peace--predominates in relations between them. When the will of one of the rival sides does not threaten the existence or vital interests of the other, peaceful coexistence is maintained between them via diplomatic compromise. In the event that the competing parties cannot resolve vitally important issues via diplomatic efforts, a state of war ensues, sometimes called diplomacy of force." It is namely such "refined" views of the goals of war and armed conflicts that are inculcated into the consciousness of American citizens by the military and political leadership of the United States. The true substance of the political goals of the class in power, the achievement of which is seen only with the aid of war, is carefully concealed from society at large.

The foundation of the substance of the political goals of modern American military doctrine was developed right after the end of the Second World War. As early as then the American military and political leadership defined the Soviet Union as a "potential adversary" of the United States. President Truman's Directive No 1496/2 of 18 Sep 45, titled "Foundations for the Formulation of Military Policy," substantiated the idea of the desirability and even necessity of unleashing a "precautionary" or "preventive" nuclear war against the USSR. Another directive, signed somewhat later (9 Oct 45) and titled "The Strategy of Utilizing the Armed Forces of the United States," set forth one of the important goals of such a war--the destruction of the military potential of the Soviet Union. The arrangement of a military offensive against the USSR that was in no way provoked was cynically justified by "higher American interests," in accordance with which "Soviet Russia should at any cost be deprived of the opportunity not only of reaching a military might equal to the United States, but the creation of means of defending against American attack."

But even the definition of the goals of war as inflicting a military defeat on the USSR and the elimination of its military potential seemed clearly inadequate in subsequent years. Therefore, in the 1946 paper "American Policy in Relation to the Soviet Union," prepared at the request of President Truman, it was noted that war against the USSR would be "total," and the armed forces should be prepared to wage it at the limits of their capabilities and using all means at their disposal--from nuclear to bacteriological. The goal of a military offensive against the USSR should be not only the destruction of its military potential, but its liquidation as a sovereign state and the

diminishment of its people to the state of an enslaved nation, ultimately doomed to gradual degradation and extinction. These positions of the American military and political leadership in preparing for a military confrontation with the Soviet Union and its total liquidation as a sovereign state were officially fixed by the U.S. National Security Council in Directive NSC-20/4 of 23 Nov 48, which, as history showed, became programmatic for all subsequent administrations and served as the foundation for no less adventuristic directives, as well as many plans for the atom bombing of the USSR such as "Charioter," "Halfmoon," "Off-Tackle," "Trojan," "Solarium," "Drop-Chute" and others.

Instructive in this regard was Directive NSC-68, composed under the guidance of P. Nitze (later nuclear-arms reduction negotiator under the administration of R. Reagan) and approved by President Truman in 1950, which fully confirmed the goals reflected in Directive NSC-20/4. In order to impart an even more aggressive nature to this directive, invoke a wave of fear and in that manner facilitate the forcing of a militaristic psyche on the country, its authors, referring to the fact of the appearance of nuclear weapons in the USSR, declared: "The Soviet threat to the security of the United States has grown sharply... It is considerably closer than was felt earlier." The interests of the military-industrial complex can be discerned quite clearly in the directive. A considerable increase in military spending was recommended--up to 50 percent of the gross national product of the country. Aside from purely militaristic goals, it expressed the hope of drawing the USSR into a new arms race and weakening it in that way. It was also envisaged to "sow the seeds of destruction within the Soviet system" and to carry out "measures and operations by secret means in the realms of economics and politics." "It has been proposed that we declare," it was noted in the directive, "that we will not employ nuclear weapons except as an answer to their use by an aggressor... If we do not intend to refrain from our goals, we cannot genuinely make such a declaration until we are convinced that we are able to achieve our goals without war or, in the event of war, without using nuclear weapons for strategic or tactical goals." And these goals consist of the following:

--"We should be strong both in affirming our principles in public life and in the development of our military and economic might.

--"We should be first in the construction of a successfully functioning political and economic system of the free world.

--"But, aside from the affirmation of these principles, our policies and actions should provoke radical changes in the nature of the Soviet system... If these changes are largely the result of actions of internal forces of Soviet society, then they will be more effective and cheaper for us."

Notwithstanding the fact that this directive was composed more than 36 years ago, it is resonant of today's declarations and plans of the American administration, which has proclaimed the Soviet Union "the evil empire" and the "principal source of the threat to American interests." It is also resonant of the ideological convictions of the American president, who at the beginning of the 1980s announced a "crusade" against the USSR and declared that the fight against communism is the purpose of his life.

The fundamental provisions of American military doctrine on issues of waging nuclear war against the Soviet Union and the possibility of achieving victory in it were reflected in Directive No 32, signed by President Reagan in May of 1982. The first use of nuclear weapons by the United States was declared to be a completely natural act pursuing higher moral goals. Special hopes therein are entrusted to a first strike which, according to the estimations of apologists of war, would permit the United States to escape revenge. The goal of such a strike is the guaranteed destruction of the political and military leadership, the armed forces (nuclear and conventional forces and weapons), communications systems and the sectors of industry that ensure the military potential of the country. This directive of Reagan also poses a series of tasks: be ready to wage war effectively in space, develop a system of space-based arms and accelerate the creation of anti-missile defenses.

Notwithstanding the declarative announcements of representatives of the American administration and the president himself, especially recently, that there will be no winners of a nuclear war, the United States is in fact continuing broad-scale measures for the practical realization of the requirements of this directive aimed at increasing the capabilities of strategic forces for inflicting a first ("destructive") nuclear strike, as well as the rapid creation of a system of anti-missile defense with space-based elements as envisaged by the "Star Wars" program.

The demonstrative conducting of a multitude of nuclear tests in Nevada in a climate where the Soviet Union continued to observe a unilateral moratorium on nuclear testing as announced in August of 1985, as well as the persistent rejection by the Reagan administration of the mutual understanding reached in Reykjavik in October of 1986 regarding the principles and time periods for advancing toward a nuclear-free world, are in full accordance with the political goals of the military-industrial complex of the United States and the principles of military doctrine that envisage preparation for a "victorious nuclear war."

The military and political leadership of the United States even today continues the policy of robbery and armed coercion inherited from its predecessors. But this policy has become even more crude, aggressive and perfidious. Since the second half of the 1970s, and especially after the Republican administration headed by Reagan came to power, an orientation toward the utmost expansion of the sphere of its sway and influence and the establishment of hegemony in world affairs is appearing ever more clearly in American foreign policy. And insofar as the chief obstacle to the achievement of these reactionary aims and the accomplishment of adventuristic designs is real socialism, the keen edge of all the socio-political principles of American military doctrine are directed first and foremost against it. Anticommunism and antisovietism are the official ideological base of the military policy and military doctrine of Washington.

Even a cursory comparison of the basic provisions of official directives in the first postwar decade with those that the political leaders of the United States utter today confirms the consistency of the political goals, reactionary nature and aggressive thrust of American military doctrine.

Presidents, secretaries and the parties in power change, but the political goals of all the military preparations of the United States, the armed conflicts and wars for which it prepared and is preparing, remain the same: the achievement of world dominion by the United States via the elimination of socialism as a system; the suppression of national-liberation and other progressive movements so as not to allow the appearance of new socialist-oriented countries; the foisting of cabalistic political, financial and economic terms and treaties on the developing states for the purpose of restraining them in the sphere of their political and economic influence.

The military doctrine of the United States, considering war as an eternal and inevitable historical phenomenon, and the threat of military force or its direct utilization as the sole effective means of achieving political goals, contains specific provisions on how to prepare the armed forces and the countries overall for waging these wars, reveals the possible nature of these wars and defines methods for waging them.

Typical for American theoreticians is a deliberately limited and one-sided approach to the selection of the basic criteria for classifying wars and armed conflicts. They reflect those views of the bourgeois ideologists according to which the modern world is a system of states that has been drawn into the struggle of two opposing socio-economic systems, and is based on the following tenets: all wars and armed conflicts are supposedly a consequence of the aggression of the socialist states or "communist forces" against the countries of the Western world; the chief indicator of the wars among states are their military and technical substance; the "cold war" and armed conflicts within states are relegated to the rank of political struggle. Armed conflicts within a state (civil wars, the fight against counterrevolutionaries and others) are provoked from without and "illegal" forms of hostile acts that have no relation, they say, to the category of war.

In essence, these basic tenets of American bourgeois ideology also determine the system for classifying modern wars that is accepted in the United States. Strategic military and technical features of wars are advanced to the forefront, and individual aspects and traits of them are made absolute. As for the socio-political grounds for analyzing wars, the application of which makes it possible to elaborate in whose name this or that war is being waged, a continuation of the policy of which classes it is, they remain silent.

In accordance with this system of classification, all possible wars and armed conflicts are considered proceeding only from their scale and military and technical features. Thus, taking into account indicators of scale (the range of goals, the number of participants and the duration of the war, the space over which military operations are expanded) are delineated into general and limited wars, and taking into account the nature of the military equipment and weaponry used and the methods of waging combat operations, either nuclear (employing nuclear weapons) or conventional (using only conventional means of destruction). Based on this approach to the classification of wars, contemporary military doctrine of the United States considers the following types possible: general nuclear, general conventional, "limited" nuclear and limited conventional.

The chief substance of general nuclear war is considered to be mass nuclear strikes. According to the estimates of American military theoreticians, it can be unleashed unexpectedly or via an escalation of limited war between two coalitions of states that belong to the two opposing socio-political systems.

The infliction of a surprise mass nuclear strike using strategic offensive forces and nuclear forces deployed in various theaters is envisaged as the principal method of starting such a war. The strike is concentrated herein first and foremost on the strategic forces of the enemy and military and state administration points, so as to disrupt or weaken as much as possible the retaliatory strike against the territory of the United States.

It is felt that the definite goals of a general nuclear war can be achieved only as a result of repeated mass nuclear strikes dispersed in time and inflicted against various objectives with strategic nuclear, military or economic potential as well as organs of state and military administration, that is, the possibility of waging not only a brief armed conflict, but a long nuclear war as well, is considered. In this regard, the military doctrine of the United States envisages the creation and storage in advance of a considerable reserve of combat-ready strategic nuclear forces in the course of combat operations, the presence of which would ensure the completion of the nuclear war on terms advantageous for American imperialism.

The military doctrine existing today also envisages waging a general war using only conventional means. Such a war, in the opinion of American specialists, will be coalitional and prolonged and will require considerable human and material resources. It could be unleashed, for example, in Europe with a disposition of political forces in the world favorable to the West and the creation of superiority in both nuclear and conventional weapons, as well as the presence of considerable human and material resources that would support the deployment of enormous armies. A general conventional war could be unleashed deliberately or arise as a consequence of the escalation of an armed conflict, including among third countries, into which the United States and the USSR are drawn (with the subsequent shifting of combat operations to other regions).

The strategists in the Pentagon are elevating general conventional war to the rank of a means of resolving global political tasks that would supposedly make it possible to reduce to a minimum the possible harm to the United States itself. The military doctrine of the United States proceeds from the fact that a preconditions for its successful waging is the achievement of superiority over the USSR in nuclear weapons, the threat of whose application would constantly be a factor in a general conventional war.

"Limited" nuclear war, according to American doctrine, can be unleashed by the Western powers first and foremost in Europe in the event of an inability of their armed forces to carry out their missions with the use of conventional means of combat. Such a war is not ruled out for other regions as well. The use of nuclear weapons is envisaged first and foremost against those groupings and combat equipment of the enemy whose destruction will lead to a sharp change in the situation in favor of the armed forces of NATO. It is felt that

the limitation of such a war to the boundaries of the military theater is possible with the presence of powerful strategic offensive forces in the United States that are ready to wage nuclear war on any scale. A "limited" nuclear war in Europe with the use of the whole arsenal of theater and tactical nuclear weapons, from the point of view of the American experts, in in its nature and possible consequences close to a general nuclear one, but without the use of the strategic offensive forces of the United States.

A limited conventional war, in the view of the American command, can occur in any region of the world with the participation of the United States and the Soviet Union, as well as their allies. The possibility of its escalation into a general conventional or nuclear war is not ruled out.

A specific feature of modern doctrine is the fact that all possible armed conflicts, along with those classifications of wars considered above, are also subdivided by their intensity--high, medium or low. Whereas conflicts of high or medium intensity are in practice substantively equated to the concepts of "general" and "limited" and "nuclear" and "conventional" war herein, low-intensity conflicts are singled out as a "special" type of war.

In the views of American specialists, low-intensity conflicts are understood to mean all possible forms of armed coercion in international relations that do not fall under the concept of "conflicts of high and medium intensity," as well as shows of force and political and ideological actions undertaken by the United States in connection with or in answer to internal political events in the developing countries that touch on the interests of American imperialism.

The theoretical grounding of this comparatively new provision of the doctrine was given by U.S. Defense Secretary C. Weinberger in 1986 in a speech at the university of national defense at a seminar devoted to low-intensity conflicts. According to his statement, the United States has the "right" to intervene at its own discretion not only in the affairs of sovereign states, but also to determine what form to use for it. He singled out three principal areas for such intervention therein: the affairs of developing countries that are headed by governments unsuitable to Washington; the support of regimes that are following in the wake of American foreign policy; and, acts of aggression against states in which, in the determination of Washington, there could exist "terrorist elements" that threaten the security of the United States.

The U.S. leadership considers the rendering of military and economic aid and the conducting of undermining ideological sabotage and psychological operations to be the most preferred form of participation in low-intensity conflicts. The threat of the use of force and direct armed intervention in the affairs of the developing countries, however, are considered to be the most important and effective forms. A bet on force and the fear of force has decisive significance in determining the place and role of low-intensity conflicts in the overall system of views toward war and armed conflicts, toward the unleashing of which the armed forces of the internationalist powers are preparing constantly and purposefully.

Such are the principal socio-political aspects of the contemporary military doctrine of the United States, which obviously testify to the fact that the doctrine in essence reflects the old political goals and aspirations of American imperialism: placing a bet on force, nuclear intimidation, an inflation of the arms race, the unleashing of new military adventures, the achievement of the unachievable--to stop or at least slow the course of world development, undesirable for it, coming out in the role of the "world gendarme," control the fate of peoples and dictate its will to the whole world. These aggressive plans, however, are doomed to utter failure. The dreams of the American strategists of achieving military superiority over the Soviet Union and over the whole socialist community are also impossible.

FOOTNOTE

1. For the technical military aspect of the doctrine, see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1982.--No 9.--pp 7-12. Ed.

12821
CSO: 1801/201

GROUND FORCES OF ITALY

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 19-24

[Article by Col Yu. Timofeyev: "The Ground Forces of Italy"]

[Text] The military and political leadership of Italy, following in the wake of the militarist policies of the United States aimed at further increasing the might of the aggressive NATO bloc, is taking steps to equip its armed forces with modern weapons and combat equipment, improve the organization of formations, units and subunits and raise the level of operational readiness of the staffs and field training of the troops.

According to the evaluations of NATO command, Italy is one of the most active participants in the bloc and supports the basic plans concerning reinforcing the political unity of the North Atlantic Alliance and increasing the military might of the combined armed forces. It constantly fulfills the obligations it has assumed for an annual real increase of 3 percent in military spending, while its armed forces take part in all NATO combined-forces exercises.

As reported in the press of the Western countries, Italy is making a material contribution to increasing the military might of NATO combined forces in the South European theater. Its armed forces are considered to be the most combat-ready and capable on the southern flank of the bloc. They trail only the United States, Great Britain, West Germany and France in the extent of the level of their technical equipping. The air and naval bases of the country are used intensively by units and subunits of the U.S. Air Force and U.S. Navy. The construction of a base for the deployment of American ground-launched cruise missiles continues in the area of Comiso (Sicily). The deployment of 112 cruise missiles with nuclear warheads is planned there by the end of the 1980s. La-Maddalena (San Stefano) is in essence a basing point for nuclear submarines of the U.S. Navy, and tactical F-16 fighters able to carry nuclear weapons are based at the airbase in Avigliano.

National "rapid deployment forces" (RDF) of a total of about 10,000 men were created in Italy at the end of 1985 with the approval of the United States and NATO. They are intended to reinforce the Italian groups of troops in the central and southern regions of the country and to protect the "national interests" of Italy in the Mediterranean regions, as well as to execute combat

missions as part of the combined forces of NATO in the South European theater. The most combat-ready formations, units and subunits of the ground, air and naval forces have been included in it.

In the estimation of military experts from the Western European countries, the territory of Italy, by virtue of its advantageous military and geographical situation, is considered to be a convenient beachhead for waging combat operations against the Warsaw Pact and the states in the Mediterranean basin. The further improvement of the system of operational equipment for the probable theater of military operations is testimony to this.

STRUCTURE. The ground forces (270,000 strong) are the principal type of armed forces and include field troops and territorial-defense troops. Their overall leadership is accomplished by the chief of the main staff (commander) of ground forces through his staff and the inspectorates of the branches of service. The main staff answers for the state and prospects for development of the ground forces, their employment in various types of combat operations and combat and mobilization readiness and issues of improving their organizational structure. The inspectorates of the branches of service (infantry, armored forces, artillery, army aviation, communications, engineering troops, protection against weapons of mass destruction and military training institutions) are responsible for combat readiness and the outfitting of the personnel and the equipping of subordinate commands and troops with weapons and combat equipment, as well as defining organization structure and monitoring everyday activity.

The operational make-up of the ground forces is: 3 corps staffs (the 3rd and 5th Army and the 4th Mountain Army corps); 4 divisions--3 mechanized (Centauro, Mantova and Folgore) and one armored (Ariete); 13 detached brigades--5 motorized infantry (Cremona, detached command of the troops of Trieste, Friuli, Acqui and Aosta), 2 mechanized (Sardinian Grenadiers and Pinerolo), 5 mountain (Cadore, Orobicca, Taurinenze, Tridentina and Julia) and a parachute one (Folgore); the detached missile-howitzer brigade Acireale; 6 detached battalions (4 tank and 2 amphibious); 4 detached artillery regiments, 6 detached artillery divisions, 2 detached Improved Hawk anti-aircraft missile regiments, a detached anti-aircraft artillery regiment, 3 detached anti-aircraft artillery divisions; 4 detached regiments and 5 detached squadrons of army aviation.

The ground forces are armed with 6 Lance guided-missile launch installations, 1,730 tanks (920 Leopard-1, 300 M60A1 and 510 M47), 4,740 M113 armored personnel carriers and VCC-1 and -2 combat infantry vehicles, over 1,300 pieces of field artillery (including 164 155mm FH-70 howitzers, 24 203.2mm M110A2 self-propelled howitzers, 18 M107 175mm self-propelled guns, 260 M109 155mm self-propelled howitzers and 360 105mm modernized mountain howitzers), 870 81mm and 120mm mortars, 1,760 antitank weapons, of which 510 are guided antitank missile launching installations and 1,250 are 75mm and 106mm recoilless rifles, 132 Improved Hawk anti-aircraft missiles and 256 40mm anti-aircraft guns along with 390 aircraft and helicopters in army aviation.

The field troops, judging by the reports of the foreign military press, are comprised basically of combined NATO ground forces in the central part of the

South European theater and are intended for waging combat operations in conjunction with the troops of other countries in the bloc. They include three staffs of army corps, four divisions, nine detached brigades (five mountain, three motorized infantry and a mechanized one) and units for combat and rear support. Their complement includes over 1,200 tanks, about 2,000 pieces of field artillery and mortars and more than 1,350 antitank weapons, including 438 guided antitank missiles and up to 300 aircraft and helicopters of army aviation.

The territorial defense troops are intended basically for carrying out combat operations in those regions of the country that do not fall under the responsibility of the field troops. They also have the mission of protecting and defending important facilities and structures, fighting enemy sabotage groups and the like. All of them are subordinate to the troop commanders of the military districts where they are stationed in peacetime. They include four detached brigades (the Acqui and Aosta motorized infantry, Pinerolo mechanized and Folgore parachute brigades), infantry and tank training battalions, artillery divisions and units and subunits for combat and rear support. The units and subunits of the territorial defense troops cannot be transferred to the NATO combined forces in the course of combat operations, but rather remain under national subordination. The detached Folgore parachute brigade (part of the "rapid deployment forces") is operationally directly subordinate to the ground forces main staff, while for issues of combat employment as part of the RDF, it falls under the armed forces general staff.

As reported in the foreign military press, the territory of Italy is divided in a military administrative sense into six military districts: the 1st (Northwest, Turin), 5th (Northeast, Padua), 7th (Toscano-Emilian, Florence), 8th (Central, Rome), 10th (Southern, Naples) and 11th (Sicilian, Palermo), and furthermore, the 8th Military District also includes the military command of Sardinia (Cagliari). All of the districts and commands include 16 military zones that are divided into 62 regions (garrisons).

The commanders of the troops of the military districts are responsible for the mobilization readiness of the formations and units of the field troops and territorial defense troops, their replenishment with personnel to full wartime strength and the formation of new formations, units and subunits in the course of mobilization deployment of the armed forces, and in wartime for the organization of the defense of communication zones, troop movements and rear support for the troops on the territory of the district. According to information in the foreign press, the call-up of over 370,000 men into the ground forces is envisaged in the course of mobilization deployment, bringing their overall total to 640,000.

ORGANIZATION OF FORMATIONS AND UNITS. In the view of the ground-forces command, the army corps is the operational tactical formation of the field troops. It has no permanent complement and can include, depending on the missions being fulfilled, one to three divisions, several detached brigades and combat and rear-support subunits. The mountain army corps can include up to five detached mountain brigades and units and subunits subordinate to the corps.

Divisions are considered to be the basic tactical formations. Two types exist in the ground forces--mechanized and armored.

The mechanized division (about 20,000 men) includes a staff and a staff company, two mechanized and one tank brigade, an armored-artillery division (a reconnaissance battalion), two artillery divisions, an artillery reconnaissance division, an anti-aircraft artillery division, a communications battalion, a combat-engineer battalion, a rear-support battalion, an infantry training battalion and a squadron of army aviation. In all there are 221 Leopard-1 tanks, over 900 infantry fighting vehicles and armored personnel carriers, 90 155mm howitzers (of which 36 are FH-70, Fig. 2), 125 mines, 134 106mm recoilless rifles, 194 guided anti-tank missile launch installations (54 TOW systems and 140 Milan systems), 24 40mm anti-aircraft guns, over 70 Stinger shoulder-fired anti-aircraft missiles and 12 AB.206A1 and B1 helicopters.

The armored division (about 16,000 men) has two tank and one mechanized brigade, as well as divisional units and subunits analogous to the mechanized one. It is armed with 272 tanks, including 255 M60A1, about 800 armored personnel carriers and infantry fighting vehicles, 90 155mm howitzers (of which 36 are FH-70), over 90 81mm and 120mm mortars, 154 guided anti-tank missile systems (54 TOW and 100 Milan), about 100 106mm recoilless rifles, 24 40mm anti-aircraft guns, over 60 Stinger shoulder-fired anti-aircraft missiles and 12 AB.206A1 and B1 helicopters.

The Italian military press notes that all brigades, both detached and those that are part of divisions, have identical structures. The mechanized brigade (about 5,000 men) thus has three mechanized and one tank battalion, a 155mm-howitzer artillery division and combat and rear-support subunits. The tank brigade (3,500) includes two tank (51 tanks each) and one mechanized battalion, a detached motorized infantry brigade (about 5,000), three motorized infantry and one tank battalion (34 tanks), while a detached mountain brigade (6,000) has three mountain battalions and one or two artillery divisions, a detached parachute brigade (over 3,000) has three parachute, an assault and a training battalion, an artillery division and a squadron of army aviation. All brigades include an antitank battalion and a rear-support battalion. Battalions of all types include, as a rule, an administrative and support company, three companies with the corresponding name and a mortar battery (except for a tank battalion). The motorized infantry subunits are equipped with trucks, while the mechanized ones have armored personnel carriers and combat infantry vehicles.

ORDER OF BATTLE. Judging from the reports of the foreign press, the order of battle of the field-troop units depends on the missions they have to execute in the course of conducting combat operations. Thus, the 3rd Army Corps in peacetime includes the Centauro Mechanized Division (the Goito and Leniano mechanized brigades and the 3rd Curtanone Tank Brigade), the detached Cremona Motorized Infantry Brigade, the 3rd Detached Artillery Regiment, a detached army air regiment (the 23rd and 53rd Air Squadrons), the 4th and 72nd Infantry Training Battalions, the 3rd Detached Communications Battalion, the 3rd Detached Combat-Engineering Battalion and rear-support subunits. Overall it

numbers 23,721 men, 255 medium Leopard-1 tanks, 162 155mm howitzers, about 180 mortars and other arms.

The 4th Mountain Army Corps has five detached mountain brigades (Julia, Cadore, Tridentina, Orobicca and Taurinenze), the 7th Detached Tank Battalion of military police, the 3rd Armored Artillery Division, the 4th Detached Artillery Regiment, the 10th Detached Artillery Division, the 4th Detached Army Air Regiment (the 24th, 44th and 54th Air Squadrons), the 4th Detached Communications Battalion, the 2nd and 4th Detached Combat-Engineering Battalions and a detached parachute company--a total of 31,692 men, 68 tanks, 270 pieces of field artillery, about 290 mortars and other combat equipment.

The 5th Army Corps has two mechanized divisions--the Mantova (the Isonzo and Brescia Mechanized and the Pozzuoli del Friuli Tank Brigades along with the 52nd, 73rd and 120th Minelaying Infantry Battalions) and the Folgore (the Gorizia and Trieste Mechanized and the Vittorio Veneto Tank Brigades along with the 33rd, 53rd and 63rd Minelaying Infantry Battalions and the Serenissima and Sile Detached Amphibious Battalions), the Ariete Armored Division (the 32nd and 132nd Tank and 8th Mechanized Brigades), the command of the troops of Trieste (the 225th Motorized Infantry Battalion and the 14th Artillery Division), the detached Acireale 3rd Howitzer-Missile Brigade (the 27th Heavy Artillery Regiment, the 3rd Lance Missile Division, the 1st and 9th 203.2mm Howitzer Divisions and the 92nd Infantry Training Battalion), the 13th Detached Tank Battalion of the military police, the 7th and 48th Infantry Training Battalions, the detached 5th Army Air Regiment (the 25th and 55th Air Squadrons), the 33rd Detached Radioelectronic Warfare Battalion, the 5th Detached Communications Battalion, the 1st, 3rd and 5th Detached Combat-Engineering Battalions and the 5th Detached Rear-Support Battalion. It numbers some 65,752 men, about 750 medium tanks (493 Leopard-1 and 255 M60A1), up to 350 pieces of field artillery and over 490 mortars, and other weapons and combat equipment.

The army corps do not include several mechanized and motorized-infantry brigades, subunits of field and anti-aircraft artillery, army aviation, communications, ECM and the like. All of them, according to data in the foreign press, are included in units that are centrally subordinate, while some of them, for example the 4th and 5th Improved Hawk Anti-Aircraft Missile Regiments (four divisions in all), the 121st Detached Anti-Aircraft Regiment (96 40mm anti-aircraft guns), the 17th, 21st and 22nd Detached Artillery Divisions (24 40mm anti-aircraft guns each) and the 235th Infantry Training Battalion, are organizationally reduced to the command of the anti-aircraft artillery directly subordinate to the ground-forces main staff.

The territorial troops order of battle includes detached brigades stationed on the territory of the 7th (the Folgore Parachute), 8th (the Acqui Motorized Infantry), 10th (the Pinerolo Mechanized) and 11th (the Aosta Motorized Infantry) military districts.

THE GROUND FORCES ARE MANNED with personnel chiefly through a draft of those obligated for military service based on the law on universal military obligation, as well as through the recruitment of volunteers, who comprise about 14 percent of the total. According to data published in the Ministry of

Defense "White Book," the number of rank-and-file personnel in the ground forces is currently over 220,000, including about 30,000 volunteers, 29,500 non-commissioned officers and 20,415 officers and generals.

Males that have reached 19 years of age are subject to the draft in peacetime. The enlistment period is 12 months. The call-up and dispatch of conscripts to formations or units is carried out monthly by the military regions. Volunteers from 17 to 22 years old can enlist for service in the ground forces by concluding a contract for three years. It can be extended in the future.

Training of ground-forces personnel is carried out at military institutes, schools for the branches of service, military academies, non-commissioned-officer schools and training centers (training battalions).

Officers for all branches of service and ground-forces services are trained at a military institute (in the city of Modena). The recruitment of attendees is done among males 17 to 22 years old that have completed secondary education (lycee or cadets of the Nunziatella Military School). The school accepts about 300 people a year. The duration of training is two years. The students receive basic training in military, technical-military and liberal-arts disciplines. Graduates of the institute receive an initial officer's rank of junior lieutenant. They then continue their training (two years) in the combined school for specializations of the branches of service (in Turin), upon completion of which they are awarded the rank of lieutenant and are sent to complete their service among the troops or on the staffs.

The leading military personnel for the ground forces undergo training at the military academy in the city of Civitavecchia. Officers that have completed the military institute in Modena and the combined school for specializations of the branches of service in Turin and have served at least ten years in command or staff positions are accepted into the academy. The training period at the academy is three years.

The non-commissioned officer corps is initially trained for a year at a school in Viterbo, after completion of which the graduates are sent to schools for specialization for five to seven months. Those that complete the course are awarded the rank of sergeant, and they are sent to complete their service among the troops. Sergeants that successfully pass competitive examinations after a definite period of service among the troops receive the rank of senior sergeant.

Basic training is carried out in three stages. The individual training of young soldiers and their specialization in training battalions is carried out for one month in the first stage. The second stage lasts two months and envisages training in a platoon, and the third as part of a company or battalion. In the last stage, the rank-and-file personnel perfect the knowledge and skills they have received, and their compulsory participation in major exercises organized according to the plans of the national command or NATO is envisaged.

The following military ranks have been established for the ground-forces servicemen: private, corporal, sergeant, senior sergeant, junior feldfebel,

feldfebel, adjutant, junior lieutenant, lieutenant, captain, major, lieutenant colonel, brigadier general (major general in technical-military and rear services), division general (lieutenant general in technical-military and rear services), corps general and army general (in wartime). The military rank of marshal can be awarded for outstanding merit in leading the armed forces in wartime.

PROSPECTS FOR THE DEVELOPMENT OF THE ARMED FORCES. The plan for the construction of the ground forces envisages the completion of their modernization before 1990 and in that manner a material increase in the combat capabilities of formations and units. Along with measures for improving the structure of formations, units and subunits, it is planned to continue equipping them with modern weapons and combat equipment. In particular, judging from the data of the foreign press, it is proposed to have 1,220 Leopard-1 and 300 M60A1 tanks among the troops by 1990 along with more than 500 VCC-1 (Camillino, Fig. 3) and about 1,300 VCC-2 APCs.

A considerable increase in the capabilities of formations and units in fighting enemy tanks is also envisaged. In this regard, the detached regiments of army aviation subordinate to the corps are being armed with A.129 Mangusta fire-support helicopters (a total of 65 is envisaged equipped with eight TOW guided antitank missiles). The antitank companies of the brigades are continuing to receive TOW guided antitank missiles (to replace the obsolete SS-11 and Cobra models), while the battalions are getting Milan missiles (a total of 1,730 guided antitank missile installations is planned: 400 TOW and 1,330 Milan). Testing in the ground forces has been completed for the Italian-made Folgore 80mm antitank rocket grenade, which will arm the battalions instead of the 75mm and 106mm recoilless guns (a total of 1,370 is planned). The capabilities of the ground forces to fight low-flying airborne targets are also being increased substantially. The formations, units and subunits have begun to be armed with the short-range Skyguard-Aspid anti-aircraft missile and 25mm self-propelled anti-aircraft gun.

Fulfillment of the plan for the construction of the ground forces, in the opinion of foreign military specialists, will facilitate a further increase in the military might of the ground forces and a rise in their standard of equipment.

12821
CSO: 1801/201

ANTITANK WEAPONS OF THE GROUND FORCES OF CAPITALIST COUNTRIES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 24-32

[Article by Col N. Fomich: "The Antitank Weapons of the Ground Forces of Capitalist Countries"

[Text] The commanders of the armies of capitalist countries, especially those in the aggressive NATO bloc, are continuing to increase the combat capabilities of their ground forces, including via equipping them with the latest prototypes of weapons and combat equipment. Considerable attention is devoted therein to questions of developing and supplying the troops with effective means of fighting tanks, which remain, in the opinion of Western military experts, the chief strike force of ground forces as before.

As noted in the foreign press, the armies of the capitalist countries currently have diverse antitank equipment that permits them to defeat armored targets across a broad spectrum of ranges. They are not only being accumulated quantitatively, but are also being improved qualitatively through the use of the latest technologies. At the beginning of the 1980s, a desire to create highly accurate antitank munitions that meet the requirements of the concept of "one shot--one kill" was seen among the leading NATO countries, especially the United States. Colossal monetary resources are expended each year for this, which, however, does not restrain the NATO bosses, who are blinded by the illusory idea of obtaining military superiority over the USSR and its allies in this sphere. And as always, the notorious myth of the "tank threat from the East" has been circulated, although it is completely obvious that their modern and supposedly defensive antitank weapons can be used just as actively and effectively in waging offensive combat operations.

Judging by the reports of the foreign press, the principal means of fighting tanks among the ground forces of the capitalist states are hand-held antitank grenade launchers, tanks, guided antitank missiles, antitank mines, field artillery pieces, reactive salvo-fire systems (RSFS) and aircraft. The use of reconnaissance strike systems, still being developed, is possible in the future. An important place is also allotted to tactical nuclear weapons, and first of all neutron ones. It is noted that the armies of several countries still use recoilless weapons and antitank guns (in limited quantities).

HAND-HELD ANTITANK GRENADE LAUNCHERS are considered to be the mass means of fighting tanks in close battle. This is a relatively simple weapon, composed of a launching tube, reactive grenade (with a hollow-charge warhead) and aiming attachments. The effective range against tanks is 300-500 m [meters] for contemporary launchers with armor penetration up to 400 mm [millimeters] (and up to 700 mm for the latest prototypes).

The development of hand-held grenade launchers abroad is proceeding principally along the path of increasing their range and accuracy, raising armor penetration and decreasing the dimensions and mass, as well as reducing features that give away position (sound, flame and smoke in firing). At the beginning of the 1980s, new prototypes of launchers were created in Great Britain, West Germany, France, Italy, Spain, Sweden and Israel. Work is being conducted simultaneously on modernizing the grenade launchers that have been used for a long time (the American M72, the West German Panzerfaust and the Swedish Karl Gustav). The command of the U.S. Army had decided to procure and deliver to the ground forces (over the course of five years) more than 360,000 Swedish AT-4 84mm grenade launchers. About half of them will be manufactured under license by the American firm of Honeywell. The APILAS launcher was selected in France in 1984, and the procurement of 70,000 of them is planned.

To defeat tanks at short ranges (up to 100 m), the ground forces of several capitalist countries can use rifle grenades fired with the aid of blanks. Their hollow charges can penetrate armor up to 300 mm thick. Firms in France and Belgium are the principal developers and producers of these grenades.

In the opinion of foreign military specialists, one of the most effective antitank weapons is TANKS themselves. They have changed in a qualitative regard. On the one hand, their armor protection has been improved considerably through the application of multilayered combined armors and their cross-country performance has been increased principally as a consequence of equipping them with high-powered engines, while on the other hand, their firepower has been increased and their capabilities in defeating armored targets have been expanded. The latter was achieved through the use of more powerful guns (smoothbore and rifled 120mm ones), new armor-piercing subcaliber shells and improved fire-control systems. The ground forces of the NATO countries are already armed with tanks that considerably exceed 1960s models in combat features. They are the American M1 Abrams tank, the West German Leopard-2 and the British Challenger.

Among the specialized antitank weapons, the chief role is allotted to GUIDED ANTITANK MISSILES, widely disseminated in the foreign armies (hundreds of thousands of them have been supplied to the troops). They currently occupy the chief place in plans for fighting tanks due to such of their qualities as long range (up to 4 km [kilometers]), high target hit probability (0.7-0.8), considerable armor penetration (500-700 mm) and comparatively small mass and dimensions.

The missiles are the main component of antitank missile systems that also include launch equipment, a sight and control apparatus. Modern systems are so-called second-generation systems that have a semi-automated control system (the operator just follows the targets, keeping it in the crosshairs of the

sight, and the missile is guided by commands that are issued automatically by the control apparatus and transmitted to it by wires). First-generation models with hand control systems required the tracking of both the target and the missile, which considerably complicated the work of the operator, who guided the missile with the aid of a handle on the control panel. This in turn reduced the hit probability, especially if it was maneuvered on the battlefield.

Foreign specialists feel that, of the second-generation systems that are currently used by the armies of the capitalist countries, the most improved are the American TOW system and the French-West German Milan and Hot systems with maximum ranges of 3,750, 2,000 and 4,000 m respectively. Work was done to improve these systems (which received the designations TOW-2, Milan-2 and Hot-2) at the end of the 1970s and beginning of the 1980s. In particular, the diameters and mass of the hollow-charge warheads were increased, pins were installed in the nose to ensure the detonation of the charge at the distance from the barrier optimal for the formation of the hollow-charge jet and, consequently, armor penetration was increased. They were equipped with infrared sights for night firing. Improved versions of these systems are already being supplied to the ground forces.

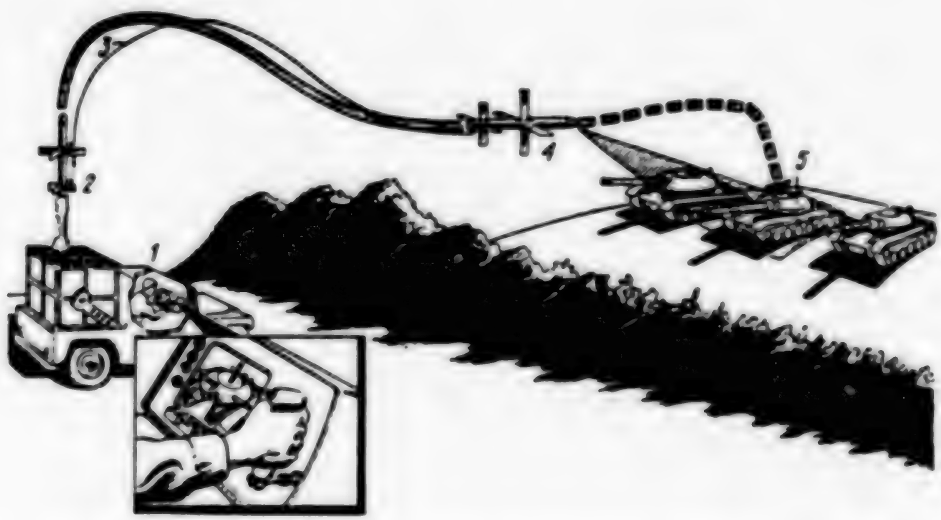

Fig. 4. Diagram of the use of a self-propelled guided antitank missile system: 1--self-propelled launch installation; 2--guided antitank missile; 3--fiber-optic cable; 4--television camera in missile nose; 5--armored target.

The recently adopted Swedish RBS-56 Bill antitank missile system is also of interest. It has a semi-automatic control system with the transmission of commands along wires and a maximum range of 2,000 m. The axis of the hollow charge of the warhead (proximity fuse) is inclined downward at an angle of 30 degrees to the longitudinal axis of the missile, which considerably increases the possibility of penetrating the frontal armor of tanks. Furthermore, the missile, flying at an altitude of about 1 m above the line of sight for aiming, can defeat armored targets from above, including tanks, frequently in

In the 1970s a trend toward using these missile systems as self-propelled antitank missile installations using a tracked chassis was noted in the principal countries of NATO. As a consequence, foreign specialists feel, the mobility of these weapons is being increased, while the presence of a closed armored body protecting the crew makes it possible to use them in forward areas. According to the reports of the foreign press, the U.S. Army is armed with over 2,000 M901 self-propelled antitank guided missile systems (equipped with 12 TOW missiles), while the Bundeswehr has been supplied with 316 Jaguar-1 (20 Hots) and about 160 Jaguar-2 (see color insert) systems. The ground forces of France have over 130 Mephisto self-propelled systems (using the VAB wheeled armored personnel carrier and 12 Hots). The Striker (10 Swingfire missiles) was created in Great Britain in the middle of the 1970s using the tracked Spartan APC, while at the end of 1986 a new model was adopted with the Milan system (13 missiles). Similar systems have also been created in Spain and Sweden.

In the opinion of foreign specialists, the helicopter is an effective carrier of guided antitank missiles. Moreover, whereas in the 1960s principally multi-purpose helicopters were equipped with antitank missiles, later, after studying experience in their combat use, the leading countries of NATO resorted to the creation of specialized combat helicopters intended first of all for fighting tanks (and they are thus often called antitank helicopters). The best one today is felt to be the American AH-64A Apache combat helicopter (Fig. 3), which can carry up to 16 Hellfire missiles with semi-active laser homing devices (maximum range of 6,000 m). The presence of good flight and technical properties, powerful armament and the latest electro-optic apparatus enables it, as Western experts note, to wage effective battle with tanks day and night under any weather conditions. The procurement of 675 such helicopters, of which more than 100 have already been delivered, is planned for the ground forces of the United States. They will supplement the existing 1,000 AH-1 Huey Cobra combat helicopters (each of which carries eight TOW missiles).

Combat helicopters have already been created and are serving in the army aviation of West Germany, Great Britain, France and Italy. The development of new prototypes is currently underway in the United States, West Germany and France.

As reported in the foreign press, in connection with a considerable increase in the armor protection of new tanks in the principal NATO countries, work has been expanded on creating third-generation antitank missiles that will be equipped with active or passive homing devices. There is no wire link between the missile and the launch installation. In essence, this is the realization of the so-called "fire and forget" principle, insofar as in the given instance the operator, having selected a target and launching the missile in its direction, can immediately shift his fire to another tank or quickly change his position. The further automatic guidance of the missile, right up to its impact on the target, will be accomplished by the homing device. The combat capabilities and survivability of the system are enhanced as a result.

In recent years, some foreign specialists have sometimes included the four guided antitank missile systems mentioned above among fourth-generation systems, insofar as in a number of capitalist countries there are in development prototypes that surpass existing missile systems in their properties, but at the same time do not fully meet the needs of the principle of "fire and forget." They therefore feel that it is more expedient to include them among third-generation systems. Thus, the majority of the systems being created aboard today will have laser-guided control systems, that is, will retain the link between the missile and the launch installation right up to impact on target as before. The development of such systems is underway in the United States according to the AAWS-M program of Ford Aerospace (one of three promising prototypes created on a competitive basis for the prospective replacement of the Dragon system) and in Western Europe by the Euromissile Dynamics Group consortium (firms from West Germany, Great Britain and France), which is doing work in particular on the creation of the ATG-3MR light guided antitank missile system to replace the Milan system in the 1990s.

The control system with a laser-guided homing device also has been accepted for arming the Israeli MARATS system (an antitank missile based on the American TOW) and the MAF (Italy), Toledo (Spain) and KAM-40 (Japan) antitank missile systems now being developed.

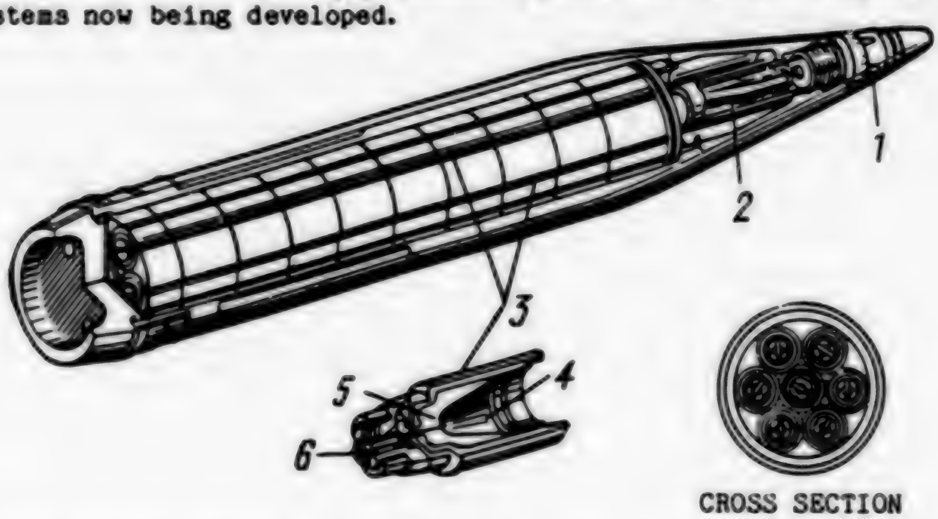

Fig. 5. West German RB-63 155mm cluster shell: 1--remote detonator; 2--bursting charge; 3--hollow-charge fragmentation elements; 4--copper lining of the hollow charge; 5--explosive; 6--fuse.

A relatively new direction is the creation of antitank missile systems (with a maximum range of up to 10 km) in which the link between the launch installation and the missile is accomplished through fiber-optic cable. Work on this plane is already being conducted in the United States, Great Britain, West Germany and France. American specialists in particular are studying a version of a self-propelled system whose missiles will be launched vertically (the launch installation is concealed) and then fly on an inclined trajectory (Fig. 4). A depiction of the terrain in front of the flying missile is transmitted with the aid of an on-board television camera to a screen on the operator's control panel, who upon the appearance of an enemy tank guides the

missile onto it, striking the target from above. In the opinion of foreign experts, fiber-optic cables can be widely employed in helicopter antitank systems, as well as in missile systems intended to fight enemy helicopters.

ANTITANK MINES are also being widely developed, especially since the appearance of new equipment and methods for mining, and first and foremost remote ones. The foreign press emphasizes that such systems (artillery, missile or aviation) make it possible to set up minefields in very short time periods, which is very important under modern conditions of maneuverable and highly transient battles. Mines can moreover be placed directly in front of advancing tanks or right in the combat formation of enemy tank units and subunits, in that manner containing his operations and creating conditions for the effective defeat of the tanks using other weapons.

The minelayers that engineering units are armed with in the ground forces of the principal NATO countries can also be used for the rapid laying of antitank mines.

Judging by the reports of the foreign press, much attention is being devoted today to the development and production of antitank mines that can defeat tanks at distances of up to 50 m. Such models have been created in the United States, Great Britain, West Germany and France. They are principally considered a means of strengthening and supplementing antitank mines of other types and are intended for the emplacement of obstacles on roads, at bottlenecks and in streets when waging combat operations is populated points, as well as covering lanes through various engineering obstacles.

The role of FIELD ARTILLERY in resolving the issue of fighting tanks has recently increased appreciably, especially since the appearance of qualitatively new munitions, including cluster and guided shells.

Non-guided artillery cluster shells of 155mm (M483) and 203.2mm (M509) calibers were first created in the United States. They contain 88 and 180 hollow-charge fragmentation elements respectively, each of which can penetrate armor up to 70 mm thick. A large quantity of fragments is furthermore created in each explosion that strikes unprotected manpower.

The West German firm of Rheinmetall has created the two 155mm cluster shells RB-63 (the numbers indicate the number of cluster-fragmentation elements, Fig. 5) and RH-49, which have greater range and effectiveness against the target than the American M483A1 shell. The range of the latest prototype, through the application of pyrotechnical devices for reducing inflow, has been increased to 30 km. This required, however, a reduction in the quantity of cluster-fragmentation elements.

The development of analogous cluster shells is also underway in Great Britain, France, Italy, Greece, Israel and South Africa.

In 1980 the United States put into series production the M712 Copperhead 155mm guided missile equipped with a semi-active laser homing head (the procurement of about 30,000 of them is planned for the American ground forces). It is intended to defeat tanks at ranges up to 16 km. Its guidance to the target,

illuminated by a laser beam, occurs in the final stage of flight trajectory (Fig. 6). Foreign specialists note the quite high hit probability for this shell. In their opinion, however, the necessity of illuminating the armored target with a laser beam right up until impact by the Copperhead guided shell can significantly reduce their effectiveness under actual combat conditions when the battlefield is covered with smoke, not to mention bad weather conditions. American specialists are therefore currently working on creating the Copperhead-2 155mm guided shell and the CGSP, which will be equipped with radar or infrared homing devices. Their maximum range will moreover be increased.

The development, first in the United States and then in West Germany, France and Sweden, of SADARM-type (a translation of the abbreviation of the English means "seek and destroy armored targets") cluster antitank shells is considered to be a new direction in the creation of highly accurate artillery munitions that meet the principle of "fire and forget." The first such prototype was the American 203.2mm XM836 shell. It contains three warheads that are thrown out in flight to the target and then descend by parachute. Through a 30-degree inclination of the warhead from the longitudinal axis and its simultaneous turning (4 revolutions/second), a radiometric system accomplishes a complete scan of the sector of terrain (in a spiral). Upon detecting an armored target, an on-board microprocessor determines the position of its center and calculates the optimal time for the detonation of the charge, acting on the principle of a hollow-charge explosive nucleus and destroying the tank from above (Fig. 7). In 1986 it was decided to continue the development of SADARM-type munitions for 155mm-caliber howitzers (each shell having two warheads) and for the 240mm MLRS unguided missile (six) reactive salvo-fire system. This work is being done on a competitive basis by Aerojet Electrosystems and Honeywell.

The West German firms of Diehl and Rheinmetall are creating 203.2mm- and 155mm-caliber cluster antitank shells analogous to the American models. Specialists of the latter firm are also developing a 155mm EPHRAM shell, the body of which houses an operational element equipped with a homing device (with radar and infrared sensors), a powerful hollow-charge warhead and missile micro-accelerators located around the perimeter for its final guidance to the target selected. The operational element will be expelled from the body of the shell at an altitude of about 1,500 m over the area where tanks are located. A braking parachute will bring it to a vertical position, in which the nose of the homing device will point downward. The homing device comes into play at an altitude of about 800 m.

In the beginning of the 1980s, a number of Western countries resorted to the creation of yet another new type of antitank weapon--GUIDED MORTAR PROJECTILES of 81-200mm caliber fired from stationary mortars. They are equipped with homing heads (infrared, laser, semi-active or millimeter-wave radar) and hollow-charge warheads. It is noted that the guided mortar projectiles, with a suspended flight trajectory, will destroy tanks from above. Judging by the reports of the foreign press, firing tests have already been conducted of experimental prototypes of guided projectiles created in Great Britain (Merlin), West Germany (Bussard) and Sweden (Striks). The development of the American GAMP 106.7mm was halted in 1986. The British Merlin projectile

(length of 90 cm [centimeters] and mass of 6 kg [kilograms], Fig. 8) has an active radar homing head that operates on millimeter wave frequencies. It can detect armored targets in an area of 300 x 300 m. A rudder located in the forward part of the body and covered in flight is used to guide the projectile to the tank.

After the appearance of special cluster warheads for the unguided missiles of REACTIVE SALVO-FIRE SYSTEMS, the latter also became an effective means of fighting tanks. The most perfected today is the American MLRS system, accepted in 1981 for arming the U.S. Army and becoming the standard for the ground forces of GReat Britain, West Germany, France and Italy.

The launch installation (12 projectors) of this system is installed on the tracked chassis of the M2 Bradley AFV. A 240mm unguided missile is employed for firing at ranges of over 30 km, containing 644 hollow-charge fragmentation elements. West German specialists have created a warhead with 28 AT-2 antitank bombs (the range has been increased to 40 km). A third type of cluster warhead that will contain six SADARM- or TGW-type (mini-missiles) charges equipped with homing devices for the last part of the trajectory and with hollow charges is in the development stage.

AIRCRAFT employed to defeat tanks are being developed principally in the direction of creating highly accurate munitions. An example is the American Maverick class air-to-ground guided missile with a television guidance system.

Capabilities in the battle against tanks have been raised in connection with the appearance of cluster weapons. The wing-mounted clusters created to date are equipped with a large quantity of small-caliber hollow-charge bombs or a combination of antitank projectiles. Currently underway is the development of cluster weapons with munitions that will be guided in the final stages of their trajectory.

As reported in the foreign press, the United States, in accordance with the Assault Breaker program, carried out research from 1978 to 1982 for the purpose of determining the practical opportunities for creating RECONNAISSANCE STRIKE SYSTEMS (RSS), as well as developing its systems and weaponry. It was initially intended for inflicting a blow first of all against tank groupings in the enemy's second echelon. The complement of the prospective RSS is planned to include a reconnaissance and guidance aircraft (with an on-board radar scanning system), a mobile ground control center and missiles with cluster warheads.

The results of the research and testing of individual components of the system confirmed the practical possibility of creating it. It was therefore decided to continue work in this direction. The U.S. Air Force is moreover responsible for the creation of the airborne on-board radar scanning system (the JSTARS program--Joint Surveillance and Target Attack Radar System), while the Army is responsible for the development of the mobile missiles (The ATACMS program--Army Tactical Missile System) and the control equipment.

In 1986 the U.S. Army command concluded a contract with LTV Aerospace and Defense that envisages the creation of a missile (w'th a maximum range of over

100 km) that is planned for equipping the cluster warhead with munitions that are self-guided on the final stages of the flight trajectory. Two such missiles will be accommodated in the modified MLRS reactive-salvo launch installation (Fig. 9). According to the reports of the foreign press, the acceptance of this missile (for a prospective RSS) is anticipated at the beginning of the 1990s. The procurement of about 1,000 missiles is planned in advance for the American ground forces. Some of them will possibly be equipped with another type of cluster warhead (with hollow-charge fragmentation operational elements, antitank projectiles or anti-concrete charges for destroying the runways of airfields). This will expand the capabilities of RSSs in defeating not only tanks, but other important facilities of the enemy as well.

In speaking of the prospective development of antitank weapons, Western specialists emphasize that they are being improved via both the creation of highly accurate munitions based on the latest technology and the modernization (in a number of cases gradual) of the standard-issue models for the purpose of bringing their combat capabilities to the level of contemporary requirements.

12821
CSO: 1801/201

DIRECTIONS OF DEVELOPMENT OF AERIAL RECONNAISSANCE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 33-38

[Article by Col A. Krasnov, doctor of military sciences and professor: "Several Directions of Development of Aerial Reconnaissance"]

[Text] In striving to achieve military superiority over the USSR and the other countries of the socialist community, the United States and its allies in NATO, along with increasing the striking power of all components of their armed forces, are devoting considerable attention to the development of aerial reconnaissance. According to the testimony of the foreign press, it has been and remains a most important component of the integrated in-depth system of reconnaissance of the aggressive bloc.

This is defined by the fact that the changes occurring today in equipment, arms and the nature of combat operations of troops entail an overall sharp increase in the need for reconnaissance, especially aerial reconnaissance. The role and significance of the latter is growing substantially thanks to its mobility and quite high degree of trustworthiness and depth.

The widespread incorporation among the troops of guided and self-guided munitions (ballistic and cruise missiles, guided aerial bombs and clusters), antitank missile systems and other types of highly accurate weaponry, according to the calculations of the NATO leadership, should provide for the defeat of any targets, including small ones. They feel that with the availability of such weaponry there is no problem in destroying targets, but there exists a problem in detecting them and delivering the information in timely fashion to the corresponding command organs.

According to the views of NATO experts, troops equipped with powerful long-range and quite accurate weapons have acquired the ability to carry out highly maneuverable combat operations at higher speeds, destroy targets at great distances and rapidly concentrate manpower and firepower in the most important sectors. The traditional sequential surmounting of defensive lines, considered unshakable as late as the 1960s and 1970s, is being replaced by mass and simultaneous influence on the enemy at the entire depth of his battle formations, including deep rear areas. They consider the basic substance of combat operations under modern conditions to be powerful mass strikes, deep

outflanking maneuvers and the envelopment of the enemy along with maneuverable meeting engagements and battles.

All of this was naturally reflected in the requirements made of aerial reconnaissance. More complete and precise data on the features and coordinates of the targets of the strike are especially needed by the troops for the destruction of targets at great depth using missiles and artillery. Under such conditions, a contradiction between the growing needs of the commanders and the capabilities of aerial reconnaissance arises and intensifies. An increase in the number of enemy military objectives has led in particular to the fact that reconnaissance faces the task of detecting and tracking only the paramount targets that pose the greatest threat to their own troops, and not all targets. The deep disposition of troop battle formations, with powerful second echelons and reserves, leads in turn to an increase in the area of reconnaissance, while their high mobility requires the more frequent observation of the it by the crews of the reconnaissance aircraft.

A new generation of aerial reconnaissance equipment, as reported in the foreign press, should provide for the reliable detection and continuous observation of the activity of the enemy over extensive regions at the entire depth of battle and operations day and night in any weather conditions, the rapid search and precise target designation of their own strike weapons and eliminate the possibility of the unexpected use of the corresponding manpower and equipment by the enemy. According to the views of NATO military experts, a direct link between the functions of detection and neutralization of the most important targets, including the guidance of means of destruction on the final stages, is becoming quite essential. In order to make full use of the capabilities of weapons, firepower and the maneuverability of troops, the processing and transmission of the information obtained should be carried out under real-time conditions. Furthermore, aerial reconnaissance, as the fastest type, should ensure the immediate monitoring of the results of one's own strikes, the selection of objectives for subsequent operations and their complete reconnaissance, as well as doublecheck information obtained from other types of reconnaissance.

Western military specialists feel that such great demands can be satisfied only with the simultaneous or rapid development of reconnaissance equipment relating to the strike weapons systems. Aerial reconnaissance is today at the threshold of great changes that should take place within the framework of the development of a unified automated system of reconnaissance and target designation able to carry out reliable and continuous surveillance of the enemy over the entire depth of the theater of combat operations. The changes will affect all possible areas of development of aerial reconnaissance, among the principal ones of which are the combination of reconnaissance and weapons equipment into unified systems, the creation of new technical reconnaissance equipment and an increase in their information capabilities.

The combination of reconnaissance and weapons equipment into unified systems is proceeding along the path of creating reconnaissance strike systems (RSS). In the opinion of foreign specialists, RSS are fundamentally new systems, at the foundation of which are a combination of the processes of reconnaissance and target destruction under real-time conditions. Earlier in the waging of

combat operations, every target had to be detected twice--during reconnaissance and directly by the crews of the strike aircraft. During the time interval between the detection of the target and the infliction of a strike against it, such mobile and highly maneuverable targets as tank subdivisions could change their locations, and it is very difficult to fight them in such a case. The RSS makes it possible to detect such targets and strike them at the same time, that is, to eliminate the necessity of repeat detection. It is emphasized that the air and ground elements of the RSS, at first glance conventional, are not the sum total of types of reconnaissance associated with each other, but an integrated and to a great extent automated system that provides for the timely use of the data obtained by reconnaissance for target destruction.

The PLSS (Precision Location Strike System) is currently being projected for use on the TR-1 high-altitude reconnaissance aircraft (Fig. 1) as the airborne element for the RSS being developed in the United States, equipped with an apparatus for radio reconnaissance and communication with ground stations for the precision guidance of strike forces to the target. In flight tests, their crews and the crews of the ground stations worked out the discovery of the dispositions of the radars for anti-aircraft missile systems, anti-aircraft guns, control stations and the feeding of data for target designation to the strike aircraft.

It is felt that in the future, with the increase in the ceiling of the high-altitude weapons of targets beyond the limits of direct sight of RSS, the air elements of which will be reconnaissance aircraft, they can be supplemented with reconnaissance-strike systems for the detection and destruction of ground targets in the deep rear of the enemy. The complement of such systems is projected to include long-range ballistic and cruise missiles, as well as prospective means of space reconnaissance.

As the Western press notes, however, a no less important direction on which the military departments of the United States and the other NATO countries are betting is THE CREATION OF NEW TECHNICAL RECONNAISSANCE EQUIPMENT--aircraft and the corresponding reconnaissance apparatus. It is emphasized herein that the United States, along with the development of tactical reconnaissance aircraft based on the newest F-15, F-16 and F-18 fighters, is also projecting two trends. One of them consists of the development of high-altitude high-speed "invisible aircraft," that is, aircraft with a small effective surface of dissipation (ESD). Experience in the development and operation of the SR-71 strategic reconnaissance aircraft and Stealth technology was widely used in the creation of one of them, which has received the designation F-19. The American press confirms that it is more expedient for the crews of these aircraft to operate at high altitudes, where it is more difficult for the enemy's anti-aircraft defenses to detect them, and reconnaissance apparatus possessing high resolution capability should be installed on them for searching out and identifying targets. Moreover, in order to achieve greater concealment in operation, it is desirable to use non-emitting apparatus on them, while emitting apparatus must be limited in power and employed only for short periods of time.

The second trend is the creation of air-space reconnaissance aircraft. The American press has advertised these aircraft more intensively recently, and they can be created, in the opinion of specialists, by the beginning of the 21st century. It is reported that they will possess the capability of maneuvering on an orbital plane, lateral maneuvering in the atmosphere and flights in it up to 75 km and higher at hypersonic speeds, thanks to which the crew will be able to resolve a wide range of reconnaissance tasks efficiently. It is also noted that after take-off they will reach orbit quickly, passing over the assigned reconnaissance regions and observing them from different altitudes. Where necessary for the systematic surveillance of one and the same regions, they can come down from orbit repeatedly, maneuver on the opposite side of the earth and return to the same orbit. The high altitudes and speeds of flight will ensure the the least vulnerability to anti-aircraft defenses.

In considering questions of aerial reconnaissance, foreign theoreticians without much confidence place an equal sign between the capabilities of one reconnaissance aircraft flying in the enemy's deep rear areas and the anti-aircraft defense systems of the latter. In their forecasts, they unanimously predict a further strengthening of anti-aircraft defensive might. In this regard, in their opinion, means of individual defense for aircraft should also be further developed. It is emphasized that the new generation of on-board systems to warn the crews of radar illumination will be multifunctional sensing devices that provide for the instantaneous measurement of the frequencies and identities of the enemy's radar in a crowded electronic environment. They will be supplemented with pulsed Doppler radar that automatically detects and identifies guided anti-aircraft and air-to-air missiles at any altitudes and determines the extent of their danger to the crew.

As the Western press testifies, promising reconnaissance apparatus is already being developed at the design bureaus. A multi-planed- approach to their creation is being noted therein. The efforts of military specialists and designers are directed first of all toward increasing the range of apparatus operation, so as to "look" with impunity at the territory of the state under reconnaissance without violating its borders in peacetime, and in wartime to conduct aerial reconnaissance without venturing into the anti-aircraft zone of the target.

The military experts of NATO feel that the new long-lens photographic equipment that makes it possible to fix the most complex of targets in border territories on film can be employed for these purposes. At the same time, they are complaining that the poor depth of capture of terrain even with promising photography forces the spy planes to go as close a possible to the border and in that manner deprives the aerial reconnaissance of concealment. Furthermore, in their opinion, even under good weather conditions the quality of the image is conditioned by the state of the atmosphere. The "knights of the keyhole" thus place great hopes on radar, especially on on-board surveillance radar and radio reconnaissance equipment whose operating range can be brought to the range of direct sight. This equipment is furthermore all-weather, and with its assistance it is becoming possible to uncover the positions of anti-aircraft defensive systems, command points and other radio-

contrasting and radio-emitting targets at distances that are measured in the hundreds of kilometers, and to a greater extent than before, to achieve concealment in operations. These stations are envisaged to be installed in particular on the TR-1 reconnaissance aircraft.

According to data of the foreign press, further development of highly sensitive apparatus for seeking and detecting the smallest contrasting and well camouflaged targets according to the various types of energy they reflect or emit and accompanied by computer complexes with equipment for collecting and processing information and the automatic classification and identification of targets is underway. According to the views of NATO experts, this will make it possible to obtain and make use of information from aerial reconnaissance that is diverse in form and substance under close to real-time conditions. A multitude of various plans up to and including most fantastic ones are proposed. Many of them are of a contradictory nature, while a considerable portion of them are rejected due to technical impracticality or exorbitant cost.

Work is currently underway in the United States and some other countries, as reported in the foreign press, on the creation of a number of reconnaissance systems of the next generation, which include: on-board surveillance radar with high resolution capability and indications of moving targets almost real-time and a multi-frequency radar system intended for the detection of targets that are concealed by vegetation or a thin layer of soil. Other types of apparatus are also being created that are able to detect and determine automatically the location of anti-aircraft radar equipment and carry out the flight testing of electro-optic systems with high resolution capability, also operating in real time with the transmission of data on concealed wide-band communications channels.

At the same time, traditional reconnaissance apparatus is being intensively improved. For example, new photographic equipment is being designed for the reconnaissance aircraft as before for the extensive surveillance of large areas, as well as for the reception of detailed data on individual targets. The capabilities of aerial photography from extremely low altitudes and high airspeeds are being expanded. In connection with the high speed and shifting of images, the panorama, multi-exposure and multi-target photographic equipment has enhanced fast-acting and illuminating capabilities. Many of them are adapted for photography at dusk and at night. Photoelectric light sources are beginning to be used instead of the traditional pyrotechnic sources of terrain illumination. Work is being actively conducted in improving infrared and laser instruments of electronic reconnaissance equipment. All of this has already permitted a considerable increase in precision in determining the coordinates of targets and the resolution capability of apparatus and an increase in the number of signals processed simultaneously.

Western military experts see in the rational integration of all types of apparatus a distinctive key opening up the possibility of detecting targets simultaneously according to large quantity of reconnaissance properties by day or night, behind clouds, including targets that are hidden by the enemy with the aid of various camouflaging means and methods. According to the reports

of the foreign press, many versions of reconnaissance systems have been developed. They already exist today in various combinations on reconnaissance aircraft. At the same time, the expansion of equipment specialization and the assortment of apparatus included in it is continuing. Wing-mounted containers with reconnaissance apparatus created both for reconnaissance and for combat aircraft are being disseminated more and more widely. In the opinion of foreign military specialists, the presence of such containers makes it possible to carry out aerial reconnaissance more effectively and to switch quickly to the accomplishment of other missions.

RAISING THE INFORMATION CAPABILITIES OF AERIAL RECONNAISSANCE is becoming yet another distinctly significant direction for its development. The anticipated changes herein, judging by the reports of the Western press, are most striking. Many publications emphasize that with the adoption of comprehensive reconnaissance apparatus, the information capability of reconnaissance has increased many times over. Furthermore, not one but several prototypes of apparatus to increase it are being installed on reconnaissance aircraft, for example, some photographic equipment for planar and perspective photography (the optical axes of their targets are directed at certain angles to each other), photographic equipment for several targets is being developed etc. All of this, in the opinion of NATO experts, will make it possible for every reconnaissance aircraft to obtain a greater volume of information in one pass over the reconnaissance area, and in one flight overall to collect information from various sensors over an area commensurate with the territory of other states.

At the same time, foreign military specialists note that the new all-weather reconnaissance apparatus with its high productivity, employed simultaneously on many piloted and drone reconnaissance aircraft, will feed in a quantity of information that will exceed even the boldest assumptions of the not-too-distant past. Waiting for the processing of this information, however, turns out to be a double detriment--great losses of time and expended labor, as well as the threat of its aging. Whereas in the 1960s the discussion of this danger seemed an idle flight of imagination, later the point of view of specialists was radically altered, since the streams of information are continuing to grow at striking rates.

What to do? How to collect, process, propagate and distribute the information gained among the interested parties in time periods acceptable for the troops?

In order to raise the information capabilities of aerial reconnaissance under such conditions, Western military theoreticians feel it is essential first and foremost to cut off excess information, but not to the detriment of its completeness. Turning to the experience of the past, they note that even then every level of command required its own degree of completeness, scale and timeliness of information about the enemy. That needed by the commander of a subunit (the detailed properties of each individual target) was not important to the commander of the formation. So it is today. Foreign military specialists emphasize the acute necessity of presenting various carefully processed and condensed information to commanders and staffs in accordance with their level. For this purpose, order must be instilled in the streams of information and it must be differentiated proceeding from the requirements of

the consumers. That is why the assertions that the more information there is, the better, evoke concern among many in the West: how to process greater streams of it in shorter time periods?

In connection with this, a desire to summarize the data right on board the reconnaissance aircraft has currently been noted abroad. Equipment is being developed for this that permits the crews to make an independent analysis of information obtained in real time or in slowed-down fashion, where necessary "freezing" an image and transmitting it to consumers located on the ground or in the air, as well as to designate targets for destruction. It is felt that the crews of aircraft that have such equipment can fly on ahead of the principal forces of strike aviation and provide them with essential information in the course of the flight.

The solution of the problem overall, however, is seen by NATO experts in the broader automation of data processing and transmission on board the reconnaissance aircraft, including images coming in from sensors of various types. Fast-acting computers with large memories that are able to carry out the comprehensive processing of large volumes of information, as well as search out methods of automatic combination of data from several sources, are being created for this. Computers are furthermore being developed for the automatic discovery of changes occurring in the status of reconnaissance targets and the nature of their functioning, as well as for the detection of newly created targets. This is proposed to be done via a comparison of the images of one and the same sector of terrain obtained at various times. The details common to both images will automatically be removed, and only the differences will be transmitted to the representation system.

The foreign press is publishing more and more materials on systems for the more distant future, which, in the opinion of Western experts, should raise the information capabilities of aerial reconnaissance. It is being reported that the functioning of such systems will be based on more improved methods, and in particular on the use of "artificial intelligence." Promising systems, in the opinion of their creators, will make it possible to determine the missions of reconnaissance, program them and issue recommendations for planning it, do comprehensive processing of data coming in from various sources, reveal the most important of them and detect contradictions and shortcomings in the data for evaluating the enemy, all without human intervention. The automatic control of the data bank and monitoring of its supplementation will thereby become possible. The forms for the issue of information (identified situations, conclusions, reports and readings) will be expanded, and the dialogue interaction of the commander with the computer in natural language or something close to it will become possible.

As for similar systems, the American military theoreticians draw the following, still somewhat fantastic-seeming picture: at the workstation, the commander has installed a portable terminal connected to a computer. Making or elaborating on a decision in the course of combat operations, the commander enters current information into this device, after which a dialogue series of questions and answers begins. The computer poses questions about insufficient information, the commander answers them, himself asks questions and receives the corresponding recommendations. It becomes clear therein how and on the

basis of what the system will accomplish the assigned missions and demonstrate the course of the "mental conclusions" in the computer.

It is emphasized that the role of the reconnaissance officers increases considerably in the software of such systems. Many foreign experts feel that it is namely specialists skilled in the realm of reconnaissance, and not the technical developers of the systems, that should formulate and impart to computer memory the initial information and the set of paradigms for the execution of procedures for the retrieval, conclusion and transformation of the required data.

Such are the principal directions of the development of aerial reconnaissance--a most important problem that the organizers of the aerial espionage of the United States and the other NATO countries are trying to resolve. By their own admissions, however, these problems, while being resolved on a technical plane, do not yet have tactical solutions. Many hypotheses on the tactics of aerial reconnaissance, models for reconnaissance flights and the interaction of people with equipment in the future are still of a schematic and inquiring nature and are far from practical realization.

12821
CSO: 1801/201

OVER-THE-HORIZON RADAR IN CAPITALIST COUNTRIES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 38-44

[Article by Lt Col K. Bogdanov: "Over-the-Horizon Radar in Capitalist Countries"]

[Text] The increase in the might of the armed forces of the United States and its allies in the aggressive imperialist NATO bloc is being accompanied by the creation of new and the improvement of existing various military equipment, including systems for the detection and tracking of airborne targets. Lately, in connection with achievements in the realm of the development of phased radar arrays (PAR) and computers and the incorporation of microprocessors into signal processing devices, the practical embodiment of over-the-horizon radar (OHR) operating in the decameter radio-wave band (3-30 MHz [megahertz]) has occurred.

As is well known, radio waves in the decameter band possess a very important trait, consisting of their ability to propagate beyond the line of the visible horizon via earth (surface) or ionospheric waves through ionospheric refraction. According to the reports of the foreign press, the effective range of OHR in the first instance is not great and can comprise 200-300 km [kilometers], which is, however, 4-6 times greater than the effective range of conventional radar against low-flying targets. The effective range of OHR with ionospheric waves, using the phenomenon of oblique incidence backscatter sounding, against aircraft and cruise missiles, is from 800 to 3,300-4,000 km (with single-hop propagation) and over 4,000 km (with multi-hop sequential reflection off the ionosphere and the earth). Insofar as the range of detection of airborne targets by OHR in both cases does not depend on their altitude, the detection range for low-flying targets by OHR stations is many times greater than for conventional stations.

OHR with oblique incidence backscatter provides for the surveillance of airspace adjoining enormous areas, many dozens of times larger than the areas that correspond to the scanning zone of conventional radar stations. It is felt that the advantage of OHR is that it can detect targets over regions that are practically inaccessible to conventional radar (for example, open spaces over the ocean). In the opinion of Western specialists, notwithstanding the fact that the effective range of OHR is an order of magnitude greater than the

range of the latter, its other detection features are considerably worse. This circumstance is explained by the very nature of ionospheric propagation, as well as the effect of interference from the earth's surface and the ionosphere.

In the plans for modernizing the air defenses of the North American continent for the period to 1988 which are being carried out at the initiative of the current American administration according to Program 414L, the deployment of a stationary OHR system intended for the formation of an external radar field around the territory of the United States is projected for the purpose of early warning of the air attack flights.

In the opinion of American military experts, the deployment of OHR will permit the detection of subsonic airborne targets 3-3.5 hours before they reach the territory of the United States, and supersonic targets 1.2 hours before. The foreign press notes that the existing ground air-defense system of the North American continent, consisting of radar detection, can warn of the approach of supersonic aircraft no more than 10 minutes ahead of time, and for the approach of low-flying airborne targets, including cruise missiles, this time period is shortened considerably.

The Pentagon is planning to deploy an OHR network around the perimeter of U.S. territory (except for the northern sector) with oblique incidence backscatter, using four posts (eastern, western, southern and Alaskan) that will face the task of detecting and tracking aircraft and cruise missiles in the airspace contiguous to the water areas of the Atlantic and Pacific oceans, in the southern sector, as well as over the northern portion of the Far East territories of the USSR (Fig. 1). It was thus decided in 1982 to deploy an AN/FPS-118, an OHR experimental prototype providing for the detection of airborne targets in an easterly direction, at a base in the state of Maine.

The eastern post in the state of Maine includes: a transmission station located in the area of Moscow-Caratunk; a receiver, located 177 km from the transmitter (near the town of Columbia Falls); and operational control and maintenance center located on the territory of the Air National Guard base not far from Bangor International Airport. The construction of the first phase of the eastern post with a scanning sector of 60 degrees (sector 1) was planned for completion in the spring of 1986, after which testing in the detection of naval-based cruise missiles would begin (testing in the detection of aircraft was carried out on an experimental prototype). In 1984 work began associated with the deployment of the second and third phases of the eastern post (sectors 2 and 3), which are projected for completion by the end of 1988. It is felt that with the entry into service of the eastern post, the possibility of detecting airborne targets over enormous spaces will appear--from Greenland to Cuba.

At the beginning of 1984, U.S. Air Force command announced a plan to deploy the western OHR post by 1988 (sectors 4, 5 and 6). Under the plan, the radar transmitting station would be deployed in Buffalo Flat (Oregon) and the receiver at Rimrock Lake near Alturas (California). The operational control center will be at the Mountain Home airbase near Christmas Valley (Idaho), with material and technical supply at Klamath Falls (Oregon).

The following sites have been preliminarily chosen for the location of the southern post (sectors 7, 8, 11 and 12): Dalen, Blangard and Galesburg (North Dakota), Andover (South Dakota) and Viton (Minnesota). The operational control center is proposed to be located at the Grand Forks airbase (North Dakota). American specialists propose that the disposition of this post in the northern part of U.S. territory will make possible the reliable detection of targets in the airspace over the Gulf of Mexico, as well as the coastal portion of the Atlantic and Pacific oceans, for which OHR surveillance is not provided by the eastern and western posts of the 414L system. The southern post is projected to enter service at the beginning of the 1990s.

After the conclusion of construction on the fourth, Alaskan, post (the location for its disposition is being decided), detecting targets in a northwesterly direction in sectors 9 and 10, it is planned to equip the southern post with additional apparatus that will make it possible to detect targets in sectors 11 and 12. The OHR installation for the detection of airborne targets from a northern direction is currently not envisaged, insofar as it is assumed that specialists would encounter great difficulties in its construction associated with the powerful signal attenuations in the polar regions and the high level of interference from auroral disturbances. The creation of OHR intended for operation in a northerly direction is thus made directly dependent on the results of research in progress on the ionosphere at high latitudes, as well as development in superfast computers.

In order to ensure the detection of targets coming in from the north, a complete renewal of the "Dew" Line and a modernization of the Alaskan Sik Igloo air-defense system, stretching from the northern shores of Alaska along the northern part of Canada and on to the southern tip of Greenland, is currently being carried out under the NWP (North Warning Program) program. The plan envisages in particular the deployment of 13 AN/FPS-117 long-range radars on the Dew Line and 39 maintenance-free two-coordinate short-range radars from Sperry. The deployment of 13 AN/FPS-117 radars is additionally planned for Alaska.

The Western press cites the following description of the composition and equipment of the eastern OHR post, part of the 414L system. The AN/FPS-118 radar station has a two-position construction (the dispersal of the receiving and transmitting stations is essential so as to eliminate the reception of emissions from the transmitter that are propagated along the surface of the earth). The OHR operates in continuous mode, which makes it possible to use less expensive components in the design of the station, figuring on the lower voltages than Doppler-impulse radars, and reducing the harmful effects of emissions on the environment and the radar equipment operating in this frequency band.

Insofar as in connection with the conditions for ensuring scanning on a horizontal plane and the required tracking precision, the transmitting and receiving PAR stations will be able to cover a detection sector of a little over 60 degrees, three antenna fields are employed to create a 180-degree emission sector. In accordance with this, the AN/FPS-118 radar transmitting station consists of three antenna systems, power amplifiers, devices for

forming the sounding signal and antenna directional pattern and computer control for station operation. In order to ensure high power potential, a multichannel system is used--each PAR emitter has its own power amplifier. It is felt that in the use of such a system, the summation of the signals of the individual emitters occurs in space, which which achieves a large power of emission comprising 100 MW [megawatts].

The antenna system is a linear phased array that includes six individual 12-element grids, the frequency sub-bands of which correspond to the sub-bands of the power amplifiers. The total length of the transmitting PAR is over 1,100 m [meters]. The height of the linear phased-array design fluctuates between 11 and 41 meters depending on the frequency sub-band. Fig. 2 shows an antenna array for a frequency sub-band of 16.5-22.5 MHz, comprising vertically disposed emission elements, behind which there is a screen. In front, along the entire length of the ground in front of the array, is a screen from metallic mesh 230 m wide. The purpose of both screens is to form the necessary antenna directional pattern with a width of 7.5 degrees and a side lobe level of 25 dB.

The transmitting device uses 12 water-cooled power amplifiers, each of which provides an output power of 90 kW [kilowatts]. The signal being emitted is modulated at frequencies of 20, 30, 45 and 60 Hz [hertz] and can have a bandwidth of 2.5, 5, 10, 50 or 100 kHz. The sequence of the inclusion of the transmitters and the form of the signals being emitted are determined by a computer. The form of the signals being emitted is fed into a device for forming the sounding signal, after which the signals are fed into a 12-channel device for forming the directional pattern of the phased antenna array. In the latter, with the aid of digital codes, the phase correlations of the signals are determined in the array emitters, which makes it possible to control the angle of inclination of the antenna directional pattern on a vertical plane, its width and the direction of the emission across the azimuth.

The receiving station includes three antenna arrays, a receiving device with a unit to convert the signals received into digital form, a device to formulate the directional pattern of the receiving antenna, and a modular system of processors for initial signal processing. The length of the receiving PAR is 1,509 m. Like the transmitting one, it has a screen behind of over 15 m, and in front a metallic screen 230 m wide. The whole range of the receiving PAR is divided into lower (5-11.12 MHz) and upper (11.2-28 MHz) ones.

Control of the wave front of the signal emitting and receiving antenna arrays is accomplished with the aid of a Univac-1616 computer. The dynamic range of the receiving device is 114-124 dB. The high-frequency amplifiers in the receiving device are made using field-effect transistors and have digital tuning carried out with the aid of a mercury relays. Before the arrival of signals into the primary data-processing processor and the receiving antenna directional-pattern forming device, they are converted into digital form.

Signal processing is accomplished by a modular system of microprocessors especially designed by General Electric. The signal processing system divides the scan sector of each beam into 4,096 cells of resolution, distinguished by

range (the time lag) and the Doppler frequencies. These processors also fulfill the tasks of suppressing active and passive interference and accomplish amplitude detection and time integration.

The post operational control enter includes computers, a device for displaying the radar information, systems that support and monitor radar operations and communications equipment. The administrative and technical services are also accommodated here. The operational center control equipment should provide for the around-the-clock combat operation of the station. The operations center staff comprises 450 people.

Output information from the receiving station microprocessor system is fed into a Univac-1100 computer, which processes the incoming signals on target range and the Doppler frequencies of the reflected signals. It has been reported that the dispersed structure of the highly productive computer complex of the OHR post with the central Univac-1100 makes possible the real-time execution of the tasks posed, taking into account the conditions of ionospheric signal propagation, and support the adaptive operation of the radar and the processing of signals in the face of reflections from the earth and a level of outside interference that is 50 dB greater than the strength of the signal. With the aid of this computer, the flight trajectory of the targets is fixed, their tracking is accomplished, coordinates are recorded, bodies of data are formulated for the display devices and information on the state of the principal radar systems is issued. The computer memory is systematically fed with data on the ionosphere according to the results of regular vertical soundings of it by stations in the United States, Canada and Denmark, as well as according to the results of reflections from the ionosphere of calibrated pulsed signals from inclined sounding stations located 900 and 2700 m from the location of the eastern post. Also entered into computer memory are daily flight plans of aircraft in the scan zones of the OHR.

In calibrating the OHR, two ground transponders are used whose distances are known: one is located in St. Anthony (Newfoundland) and the other in Narssarssuak (Greenland). Calibration can also be done according to signals from aircraft equipped with special receiving and transmitting apparatus (this method is suitable when it is impossible to locate ground transponders). Furthermore, the coordinates can be elaborated with the aid of reflections from fixed objects such as islands whose coordinates are precisely known.

The foreign press notes that the operation of OHR requires particular caution in the choice of operating frequencies so as to ensure compatibility of its operation with other radio and radio-navigational equipment in the decameter and meter radio wave-bands. The radar operating frequencies are programmed in such a way that in the event the operator selects a frequency on which emissions could interfere with other systems, the computer automatically disconnects the transmitter. The forbidden frequencies include in particular the frequencies of the VOR [VHF omnidirectional range] radio-navigational system. Electromagnetic compatibility is achieved by a high stability of emissions with the precise setting of the carrier wave of no more than 1 Hz. The device for monitoring how busy the OHR frequency band is, a spectrum analyzer, provides for the choice of a precise value for the operating

frequency for the station and a bandwidth for the emissions with a regard for the minimal level of active interference from radio equipment operating in its frequency band, and the least effect of the radar emissions on the operation of other radio equipment.

The control and display device includes the following consoles: detection and tracking, cartographic, radio-wave propagation monitoring, tactical and technical feature evaluation, identification and correlation, and senior operator. The first console shows the process of target tracking. Notations on the echo signals are displayed on a console indicator screen in the form of vertical lines if the signals are characterized by a constant Doppler frequency. If the target is accelerating, the upper part of the pulse bends to the left, and if it is slowing down, it bends to the right.

A detection and tracking screen shows the flight trajectory of a supersonic airborne target over 14 minutes (the time is fixed on the y-axis). Every vertical mark on the screen corresponds to a constant Doppler speed. The screen also shows additional numerical and letter data: the number of the trajectory, the slant range, the rate of change of the slant range, the quality of reception, the target azimuth, the horizontal range and target speed, as well as Greenwich time.

The cartographic indicator makes it possible to get a geographical fix on the targets being tracked and track them relative to a geographical network of coordinates and continent outlines. The indicator for monitoring the propagation of radio waves determines the conditions for the passage of the selected operating frequencies, which are transmitted to the OHR console of the operator monitoring the current features of the radar via a comparison of amplitude for the reflected signals with the level of outside noise. The identification of targets is done on the intensification and correlation console, and "their own" targets are shown that are flying in accordance with a required schedule. The senior operator's control console is a letter and number device whose indicator is used for depicting the most important reports and commands, as well as monitoring their utilization. It furthermore has an individual indicator device to monitor data from other consoles.

Aside from the stationary OHRs, much attention in the United States is being devoted to the creation of tactical portable (by air or ship) versions of OHR--ROTHR (Relocatable Over-the-Horizon Radar)--intended for naval forces and the interventionist "rapid deployment forces." It is being reported that Raytheon has been developing such stations since 1984. In the opinion of American experts, such OHR could be delivered to any region of the globe in which long-range detection equipment is lacking. The radar will be smaller than the stationary type and have less of an operating range (oriented within the limits of 900-3,000 km). The use of transmitting modules (average power in broad-band frequencies of up to 100 KW) and receiving devices with band-transmission frequencies up to 100 KHz, low noise levels and high resistance to interference with computer-resettable frequencies that provide for the coherent processing of signals is projected in it.

American military specialists feel that the OHR can be employed in Western Europe to improve air-attack warning systems and are trying to interest

European countries in deploying such stations. As a result of pressure on the part of the United States, Great Britain has renewed work on a special program associated with the deployment of OHR in the southeastern part of England at Orford Ness (at one time work on the AN/FPS-95 OHR, transmitting in the 6-60 MHz range, was halted, judging by the reports of the foreign press, due to unsatisfactory detection features). Testing of an active linear PAR developed in the United States is planned for the country of Wiltshire in the near future. The firm of Marconi is creating the receiving and transmitting apparatus for the station, as well as the control and display equipment. It is proposed that the OHR will be able to detect and track aircraft and cruise missiles in the area of the Baltic Sea.

The Pentagon is also trying to put pressure on France for it to deploy an OHR in the south of its territory, which would carry out surveillance of the airspace over the Mediterranean Sea and North Africa.

Work is continuing in Australia on the creation of an OHR in the decameter radio-wave bands that is intended for the scanning of the northern approaches to the continent. It has been reported in particular that the station known known under the name of Jindali-B, along with Alice Springs and a receiver in Mount Ivered, have already done testing, in the course of which satisfactory results in the detection of airborne targets and surface ships at great distances were obtained. This radar has quite complex equipment. The beam rolling control in a wide sector and the selection of operating frequencies in the detection and tracking of targets is done with the aid of a fast computer. The conversion of the experimental Jindali-B radar into a combat one is planned for the second half of the 1980s.

Japan is conducting preliminary negotiations on the procurement of OHR with oblique incidence backscatter from the United States which is projected to be located on the island of Iwo Jima (1,200 km south of Tokyo).

Work is also currently underway in the West on experimental research and design of OHR that uses surface waves for the detection of airborne targets. This was caused by the fundamental opportunity of utilizing them to detect low-flying aircraft, cruise missiles and submarine-launched ballistic missiles. It is felt that in the detection of targets by OHR whose work is based on the phenomenon of defraction, there exist better conditions, since in the given instance ionospheric effects are lacking. Great range of detection is also ensured in the long-wave portion of the decameter band in signal propagation over the ocean surface. Western specialists, however, propose that comparatively large antenna arrays will be required for these radars and their reliable operation will be ensured only with high-power emissions. The effective range of these radars can reach 250-300 km. British military specialists feel that in the future surface-wave OHR can be deployed on the coast or on surface ships.

According to reports in the foreign press, the British firm of Marconi is developing an OHR that uses the phenomenon of diffraction, as well as the recently discovered phenomenon consisting of the fact that the horizontal propagation of radio waves occurs in a narrow segment of the air directly over the ocean surface. Such a type of propagation they supposedly associate with

the electrical properties of ocean water, caused by the presence of dissolved salts in it. A working frequency up to 90 MHz can be used therein for radar purposes. It is proposed that aircraft and cruise missiles, with the aid of such OHR, will be detected at a range of 320 km. British experts feel that four or five OHRs will be required to cover the water area of the North Sea.

There is one other direction of work associated with the use of surface-wave OHR for the partial elimination of so-called "dead zones" that arise in radar operation with oblique incidence backscatter. In the opinion of specialists of the American firm of General Electric, equipment developed for the AN/FPS-118 radar, as well as that used in shortwave communications equipment, can be used as a subsystem of surface-wave OHR.

Such, judging by the reports of the foreign press, are the contemporary state and some of the development prospects in work on creating over-the-horizon radar detection systems in the developed capitalist countries.

12821
CSO: 1801/201

THE FRENCH 'RAFALE' EXPERIMENTAL FIGHTER

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 44-45

[Article by Col Yu. Belyayev, candidate of technical sciences: "The French 'Rafale' Experimental Fighter"]

[Text] Aircraft occupy one of the "prestige" places in the arms race. They cede to some missile weapons systems in cost, but always attract the attention of the military-industrial circles of the West relative to stable markets for sales and prospects for replenishing losses in the course of military conflicts and local wars that arise. In the 1990s, the leading NATO countries intend to adopt a new generation of fighters. The complexity of the new aviation technology, however, in the opinion of foreign commentators, makes necessary its careful preliminary testing and evaluation on experimental aircraft especially built for this purpose.

The AFTI program is being carried out in the United States to resolve this task, and flight tests are underway of the X-29 with a forward-swept wing and the NIMAT drone. Analogous work is also being conducted in a number of European countries as well, including in France, where the experimental Rafale fighter has been created (see illustration). Judging from the materials of the foreign press, its development began in 1983 at the Dassault-Breguet firm with the support of the French Ministry of Defense under the ACX program (Avion de Combat Experimental--Experimental Combat Aircraft), and the name Rafale appeared later. Its estimated tactical and technical features are cited below.

The Rafale aircraft is a single-seat fighter with the delta wing typical of French fighters, forward-situated horizontal empennage and side air intakes under the wings. The wings have advanced mechanization: each wing panel has three elevons and a three-section leading-edge flap across its whole sweep, automatically controllable along with the elevons. Up to 50 percent of the fuselage and the greater portion of the wings are made with hydrocarbon composite materials. The control system is a remote electronic one with fourfold redundancy. Depending on what is being carried on external mounts, it provides for the automatic limitation of handling according to the angle of attack, g-loading and the angular roll velocity.

Crew	1
Mass, kg:	
Empty aircraft	9,500
Take-off (air-defense version armed with four air-to-air missiles)	14,000
Maximum take-off weight	20,000
Fuel in internal tanks	4,250
Combat load in ground-attack configuration	3,500
Radius of action with 3,500-kg combat load, km	650
Power plant:	
Number x type x designation of engines	2 x TRDDF x F404
Dimensions, m:	
Length	15.5
Height	[illegible]
Wingspan	10.6
Wing surface area, square meters	47
Flight speed:	
Maximum at high altitudes, Mach	2
Maximum at sea level, km/hr	1,480
Landing, km/hr	220
Maximum positive acceleration limit at subsonic speeds:	
At an altitude of 6,000 m	6
At sea level	9
Length of take-off run, m:	
At a take-off mass of 14,000 kg	400
At a take-off mass of 20,000 kg	700

An important component of the on-board equipment is the prospective radar to be installed in the development which, according to the estimates of French specialists, will be able to detect airborne targets at a range of up to 92 km [kilometers], simultaneously track up to eight of them and automatically evaluate the extent of their threat and their priority.

Distinguishing features of the cockpit equipment include: the presence of a side handle for controlling the aircraft (on the right), a holographic indicator with diffraction optics on the background of the windshield glass (field of view 20 x 30 degrees) and two multifunctional indicators.

The power plant of the aircraft consists of two American F404 turbofan engines, while in the future the use of the analogous domestically developed M88 engine is envisaged (the rated design features of the M88 are cited below). The Rafale is equipped with an aerial refueling system.

Maximum thrust, kg:	
With afterburner	7,500-8,500
Without afterburner	5,500
Proportionate fuel consumption, kg/kg-hr:	
With afterburner	1.8
Without afterburner	0.8
Moisture-free mass, kg	850
Turbine gas temperature, degrees Celsius:	
Experimental prototypes	1,430
Series-produced engines	1,550
Total extent of pressure increase	24

The built-in armaments include two Defa-554 30mm cannon housed along the sides of the fuselage. In the course of flight testing, test equipment will be installed on the left side instead of the cannon. There are 12 assemblies, including 6 under the fuselage, for hanging armaments. One configuration of mounted armaments in the fulfillment of missions associated with striking ground targets is considered to be the following: two guided aerial bombs with laser homing, six guided air-to-air missiles. In addition, a container with ECM equipment, a container with electro-optic apparatus and two additional fuel tanks with capacity up to 2,000 liters can be mounted. The total mass of the combat load can reach 3,500 kilograms. The mounted armaments of the aircraft can also include air-to-ground missiles with electro-optic homing systems.

As has been reported, flight testing of the Rafale fighter began in the middle of 1986. Although, according to the intentions of its developers, it is experimental and intended for the testing and development of new technology, judging by the materials of the foreign press, however, the firm is offering it to the French Air Force for series production as a new-generation combat aircraft. The development of an aircraft under the theoretical designation of ACT (Avion de Combat Tactique--Tactical Combat Aircraft), and for the navy, ACM (Avion de Combat Marine--Naval Combat Aircraft), is planned for the 1990s based on its technology.

Furthermore France, participating in joint work with the other NATO countries in creating a new-generation European combat aircraft, intends to use the experience of the Rafale development project, as well as its technology. The French, however, are encountering strong competition on the part of their West European partners, especially the British, who are developing an experimental aircraft for an analogous purpose.

12821
CSO: 1801/201

NAVAL REGIONS OF THE JAPANESE FLEET

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 47-54

[Article by Capt 1st Rank F. Rubin under the rubric "Navies": "The Naval Regions of the Japanese Fleet"]

[Text] The Japanese military and political leadership is systematically and persistently taking steps to increase the military potential of the armed forces. This is visibly demonstrated in the constant annual increase of 6-7 percent in military spending. A trend toward the expansion of military collaboration between the United States and Japan, the antisoviet thrust of which is not concealed by the official Japanese press, is being distinctly manifested. Increased attention is being devoted to the development of naval forces: over the course of recent years, the annual growth in the naval budget has been 8-10 percent, exceeding the average level for the armed forces overall.

In the opinion of the Japanese command, the fleet, which includes submarine, escort and minesweeper forces, as well as an air command and other formations and units that are directly subordinate to it[1], should play the principal role in naval operations conducted either independently or in interaction with the U.S. Seventh Fleet. At the same time, a number of important missions, especially in the regions of the straits and coastal waters, are lately being charged to the forces of the naval regions [NR].

This article, based on materials from the open foreign press, considers the missions, zones of responsibility and organizational structure and composition, as well as the basic prospects for the development, of the naval regions of Yokosuka, Kure, Sasebo, Maizuru and Ominato. The formations and units that are included in the naval regions can, either independently or with the support of forces from the fleet or other types of armed forces, execute the following missions: protect naval bases, ports and the water area, perform patrol duty, maintain a necessary operational regimen, monitor the surface and underwater situation; participate in blockades of strait zones, including fighting with submarines and surface ships; take measures for various types of defense (anti-mine, anti-patrol boat, anti-assault and others); assist ground forces on the shore flanks; and, provide rear support for the fleet.

The boundaries of the zones of responsibility for the naval regions are defined by the law on the "self-defense forces" (1954), wherein each naval region is allotted a certain portion of the territory of Japan within limits essential for the combat operations of the navy and the maritime areas adjoining it (Fig. 1).

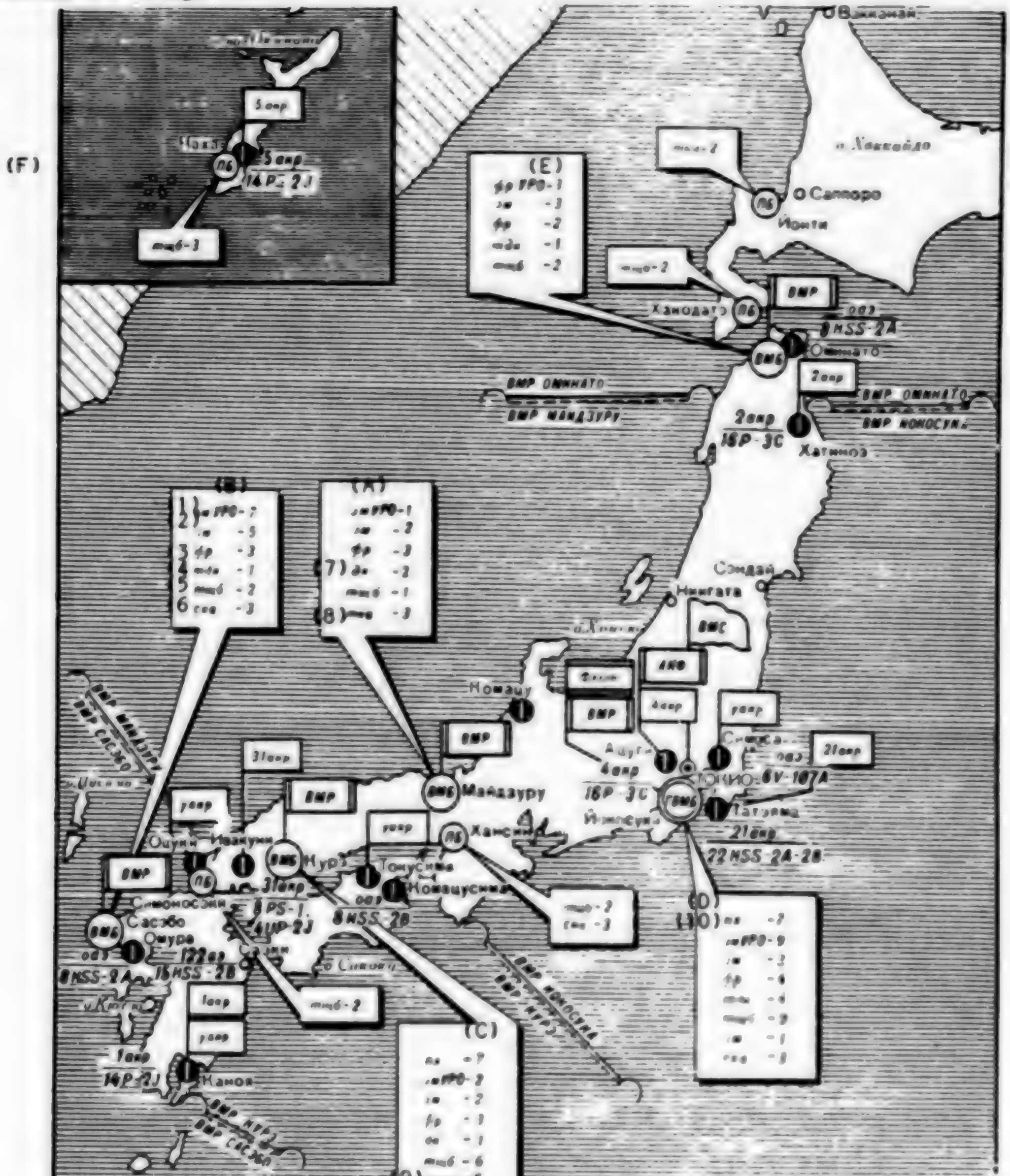

Fig. 1. Zones of responsibility for the naval regions and the basing of the Japanese Fleet

Key: A--Maizuru region; B--Sasebo region; C--Kure region; D--Yokosuka region; E--Ominato region; F--Okinawa inset map.
[tables show complement of vessels at each base]
1--guided-missile destroyers; 2--destroyers; 3--frigates; 4--armored vehicle landing craft; 5--minesweepers; 6--patrol boats; 7--assault ships; 8--torpedo boats; 9--minesweeper launches; 10--submarines.

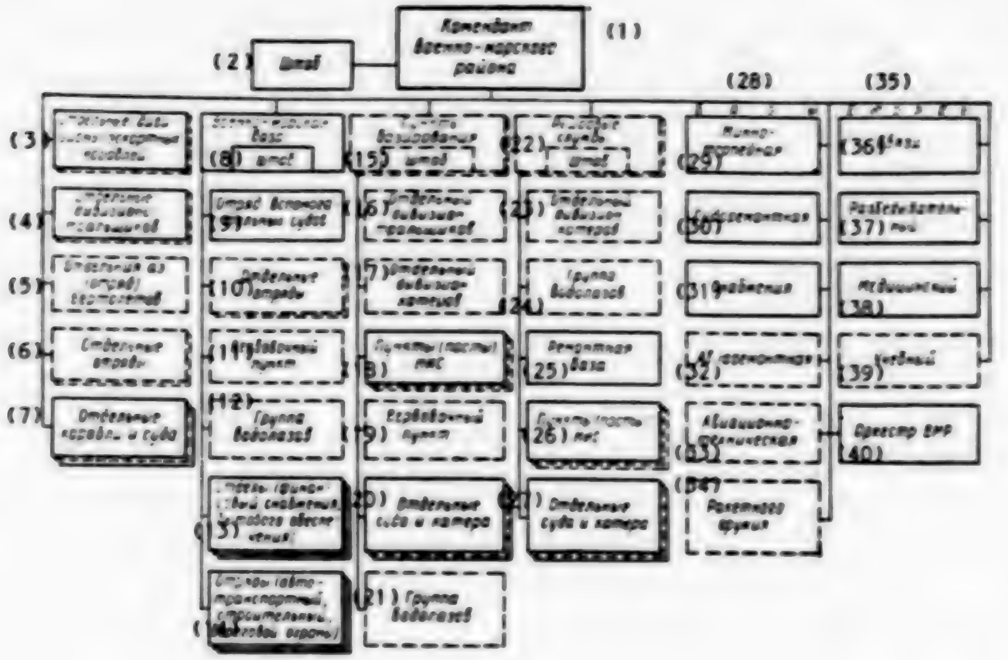

Fig. 2. Fundamental organization of the naval regions of Japan (the dotted lines designate elements that are only part of some naval regions, naval bases, basing stations or harbor services)

Key:

1--Commandant of naval region
2--Staff
3--Detached escort ship divisions
4--Detached minesweeper divisions
5--Detached air squadrons (detachment) of helicopters
6--Independent detachments
7--Detached ships and vessels
8--Naval base
9--Detachment of auxiliary vessels
10--Independent detachments
11--Recruiting station
12--Group of divers
13--Departments (finance, supply, routine services)
14--Detachments (trucking, construction, shore security)
15--Basing stations
16--Detached minesweeper division
17--Detached patrol-boat division
18--SC stations (posts)
19--Recruiting station
20--Detached ships and vessels
21--Group of divers
22--Harbor services
23--Detached patrol-boat division
24--Group of divers
25--Repair base
26--SC stations (posts)
27--Detached ships and vessels
28--Bases
29--Mining and torpedo
30--Ship repair
31--Supply
32--Aircraft repair
33--Aircraft equipment
34--Missiles
35--Detachments
36--Communications
37--Reconnaissance
38--Medical
39--Training
40--Base orchestra

The naval region is headed by a commandant (authorized rank of vice-admiral) to whom is subordinate, through headquarters, the ship formations and air subunits, naval base, base points and harbor services with the units and subunits subordinate to them, as well as shore units and services of various types (Fig. 2). The naval-region staff is headed by a chief (rear-admiral) to whom are subordinate three departments (administrative, operational and financial) and three detachments (engineering and technical, supply and medical), as well as an inspection group.

Ship formations. Individual divisions of escort ships (of two-three ships) exist in each naval region (one in the Maizuru and two in the rest). Furthermore, individual divisions of land-based minesweepers directly subordinate to the commandants of the naval regions are also part of the complement of the naval regions of Yokosuka and Maizuru, while the Kure NR includes the only separate divisions of minesweeping launches in Japan, the 101st. There are also individual divisions of land-based minesweepers and torpedo and patrol boats that are subordinate to the commanders of some of the bases or harbor services rather than the NR commandants.

Air subunits are represented by individual squadrons of ASW helicopters in the naval regions of Kure, Sasebo and Ominato, as well as a detachment of helicopters in the Yokosuka NR.

There is a naval base in each naval region. The base commander (authorized rank of captain 1st rank) has subordinate to him a staff, a detachment of auxiliary vessels and individual detachments stationed in various places, as well as shore subunits: three detachments (motor-vehicle transport, construction and shore security) and three departments (finance, supply and routine support). The Kure and Maizuru NRs have naval recruiting stations, while the base commanders of Ominato and Kure have groups of divers subordinate to them.

Basing stations are part of only three naval regions: Hanshin for the Kure NR, Shimonoseki and Naha (Okinawa) for Sasebo NR and Hakodate and Yoichi for the Ominato NR. The authorized rank of the commander of the Hanshin basing station is rear-admiral, and captain 1st rank for the others. The station commander has subordinate to him a staff, individual divisions of minesweepers and patrol boats and stations (posts) for underwater and surface surveillance and communications (SC), as well as individual vessels and patrol boats. The Naha basing station furthermore includes groups of divers and a recruiting station.

Harbor services directly subordinate to the NR commandants have been created in the naval regions of Yokosuka, Sasebo (two) and Maizuru. The commander of the harbor service has subordinate to him a staff, torpedo or patrol boats, SC stations (posts), a group of divers and a shipyard, as well as individual vessels and boats. There are no harbor services in the Kure and Ominato naval regions, and their functions are partially fulfilled by divisions of patrol boats and SC posts that are part of the base stations of Hansdin, Hakodate and Yoichi. The mission of carrying out shore surveillance is also executed by the corresponding subunits of individual detachments from the naval bases.

As noted in the foreign press, the Japanese naval command has planned measures to improve the organizational structure of the naval bases, basing stations and harbor services. It is planned to carry out their re-organization in the 1987 fiscal year (beginning April 1). The principal goal of this re-organization consists of creating a standard complement for the naval bases, basing stations and harbor services along with individual naval detachments, as well as a more precise delineation of functions among them in rear support for the fleet.

The shore units and services of the naval regions include four detachments: communications, training (except for the Ominato NR), reconnaissance and medical, as well as three bases (mining and torpedo, shipyard and supply) and an orchestra. Three NRs (Yokosuka, Sasebo and Ominato) also have aircraft repair bases at the airfields of Shimosa, Kanoya and Hachinohe respectively. An aircraft technical repair base (Kisarazu) and a missile base are furthermore also subordinate to the commandant of the Yokosuka NR.

Judging by the materials of the foreign press, the majority of the shore units and services of the naval regions (the medical detachment, the mining and torpedo, the shipyard, supply, missiles, aircraft repair and aircraft technical bases), as well as the naval-base shore subunits (detachments: motor-vehicle transport, construction, shore security and auxiliary vessels; departments: finance, supply and routine services) carry out functions in rear support for the formations and units not only of the corresponding regions, but of the fleet as well, that are stationed in the territory of their zone of responsibility.

The overall leadership of planning and organization of NRs of various types is charged to the fleet commander, accomplished through a staff and administration for fleet material and technical support, as well as the commandants of the naval regions. The shore units and services of the NRs indicated above, as well as the shore subunits of the naval bases and the base detachments of the submarine squadrons, are occupied with practical issues of supporting the formations and units of the fleet.

Rear support is planned and conducted separately by ship and aircraft formation.

The receipt of weapons, technical equipment and other essential items of supply for individual ships and formations, as well as the shore subunits of the naval bases and basing stations, is handled from supply bases.

Questions of support for the air units of the fleet are the province of the corresponding departments of the fleet staff, the fleet material and technical supply administration and the aircraft technical and aircraft repair bases of the naval regions through warehouses and groups for aircraft engineering and airfield technical support.

The Yokosuka naval region is the central and largest one. Organizationally it includes: a staff, the 33rd and 37th Frigate Divisions (four Tikugo-class ships), the 46th Minesweeper Division (two Takami-class), a detachment of

auxiliary helicopters assigned to the icebreaker Sirase, a detachment on the island of Titijima, the Yokosuka naval base, the Yokosuka harbor service, shore units and services directly subordinate to the naval region and individual ships and vessels.

The Yokosuka naval base, aside from a detachment of auxiliary vessels and shore subunits, includes the Funakosi detachment (the region of the city of Yokosuka, where the fleet headquarters is located) that carries out various support functions. The Yokosuka harbor service includes the 1st Patrol-Boat Division (three boats), a group of divers, a repair base and two SC posts. Five central bases are allotted for the shore units and naval-region services: missiles and mining and torpedo ordnance, ship and aircraft repair and an aircraft technical base. An armor-assault landing craft, six obsolete ships and reserve boats, over 40 auxiliary vessels and several pieces of floating equipment are also assigned to the naval region. The personnel complement of the Yokosuka naval region is over 3,000 men.

The Kure naval region is considered the second most important. It includes: a staff, the 22and destroyer Division (two Minegumo-class ships), the 38th Frigate Division (three Tikugo-class), the 101st Minesweeper Launch Division, the separate Komatsushima Squadron of ASW helicopters (eight HSS-2B), the Kure naval base, the Hanshin basing station, shore units and directly subordinate services along with individual ships and vessels. The Kure naval base, aside from a detachment of auxiliary vessels, a group of divers and shore subunits, includes the Saiki detachment and a recruiting station. The 45th Minesweeper Division (two Takami-class sweepers), the 2and Patrol-Boat Divisions (three vessels), the Yura detachment and three SC posts in the Kii Strait zone are assigned to the Hanshin basing station. Among the shore units and services of the Kure naval base are a supply base to which the largest fuels and lubricants depot in the fleet is subordinate. The number of personnel is over 2,500 men. Aside from the aforementioned combat ships, the Kure naval region includes a landing craft, five reserve ships and boats and about 35 auxiliary vessels and pieces of floating equipment.

The Sasebo naval region has the most complicated structure and consists of: a staff, the 21st Destroyer Division (three Yamagumo-class ships), the 34th Frigate Division (three Tikugo-class), the detached Omura ASW helicopter squadron (eight HSS-2A), the Sasebo naval base, the basing stations of Shimonoseki and Naha, the Sasebo and Tsushima harbor services, shore units and services directly subordinate to the naval region along with individual ships and vessels. The Sasebo naval base, aside from a detachment of auxiliary vessels, a group of divers and shore subunits, includes the Amami detachment stationed on the island of Amami. Subordinate to the commander of the Shimonoseki basing station are the 43rd Minesweeper Division (two Takami-class), an SC post on the island of Mutsure (the approaches to the Shimonoseki Strait), a recruiting station and individual ships and vessels. The 49th Minesweeper Division (three Takami-class), a group of divers and a recruiting station are at the Naha basing station (on the island of Okinawa). The Sasebo harbor service (the water areas on the approaches to the naval base with the same name) includes the 3rd Patrol-Boat Division (three boats), a group of divers, a repair base and an SC post on Kogosaki. Three SC posts are subordinate to the commander of the Tsushima harbor service (his zone of

responsibility includes the Korean Strait): on the islands of Kaminoshima, Shimonoshima and Iki. Among the shore units and services of the naval region is the aircraft repair base of Kanoya.

The number of personnel in the Sasebo naval region is over 2,500 men, it has 14 combat vessels and small combatants, including one armored-assault landing craft, 12 obsolete ships and reserve combatants and over 35 auxiliary vessels.

The Maizuru naval region includes: a staff, the 31st Frigate Division (three Isuju- and Tikugo-class ships), the 44th Minesweeper Division (two Takami-class), the Maizuru naval base and harbor service, shore units and services directly subordinate to the naval region and individual ships and vessels. The Maizuru naval base, aside from a detachment of auxiliary vessels and shore subunits, has the Niigata detachment and the Sakai recruiting station subordinate to it. The harbor service includes the 2and Torpedo-Boat Division (three PT11-class), a group of divers and the SC post on the island of Bakuti in the Maizuru region. Also subordinate to the commandant of the naval region are a landing craft, nine reserve ships and small combatants and about 20 auxiliary vessels and various pieces of floating equipment. The number of personnel does not exceed 2,000.

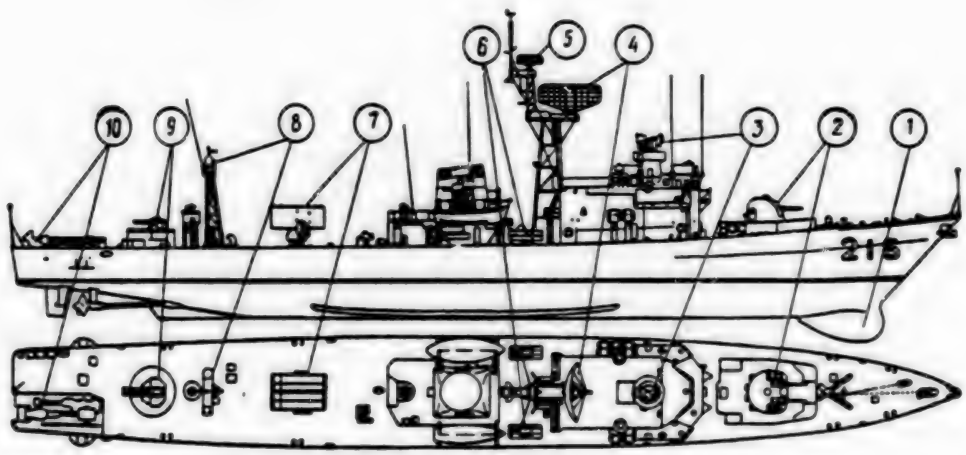

Fig. 3. Japanese Tikugo-class frigate: 1--Keel low-frequency type-66 sonar (QQS-3A); 2--76mm type-68 paired gun (Mk33); 3--fire-control radar antenna; 4--OPS-14 airborne target-detection radar antenna; 5--OPS-17 surface-target detection radar antenna; 6--324mm type-68 three-tube torpedo apparatus (Mk32); 7--eight-charge type-74 ASROC launcher (Mk16); 8--NOLR-1B (NOLR-5 for the DE219 Ivase) radio and ECM station antennas; 9--40mm paired Mk1 guns; 10--AN/SQS-35 variable-depth towed sonar (except for DE216 Awaji, DE217 Mikuma, DE221 Niyodo, DE222 Teshio and DE225 Noshiro)

The Ominato naval regions includes: a staff, the 35th Guided-Missile Frigate Division (three Isikari- and Yubari-class ships), the 32and Frigate Division (two Isuju-class), the detached Ominato ASW helicopter squadron (eight HSS-2A), the Wakkanai detachment, the Ominato naval base, the basing stations of Hakodate and Yoichi, shore units and services directly subordinate to the

naval region and individual ships and vessels. The Ominato naval base, aside from a detachment of auxiliary vessels and shore subunits, includes a group of divers. The 47th Detached Minesweeper Division (two Takami-class) and three SC posts located at the western entrance to the Sangara Strait are subordinate to the commander of the Hakodate basing station. The Yoichi basing station includes the 1st Detached Torpedo-Boat Division (two PT11-class). The naval region also includes an aircraft repair base at Hachinohe.

The number of personnel is about 2,700. Aside from the indicated forces, an armored-assault landing craft, six reserve ships and small combatants and over 20 auxiliary vessels and pieces of floating equipment are assigned to the region.

The ship complement of the naval regions, as testified to by the Western press, includes 41 combat ships, 20 small combatants, 20 obsolete reserve ships (six destroyers, five small ASW ships and nine land-based minesweepers) and 18 landing craft, as well as over 150 auxiliary vessels, small craft and various pieces of floating equipment.

Among the escort ships, almost half are 11 Tikugo-class frigates (side numbers DE215-225). Their standard displacement is 1,470-1,500 tons, loaded is 2,000 tons, length 93 m [meters], beam is 10.8 m and draft is 3.5 m; the power of the two-shaft diesel power plant is 16,000 hp [horsepower] and maximum speed is up to 25 knots. The ship's armaments are shown in Fig. 3.

The most modern ships are the three Isikari- and Yubari-class guided-missile frigates[2], while the most obsolete are the four Isuju-class frigates built at the beginning of the 1960s, which are planned for removal for the combat formation and replacement with the new class of DE229 guided-missile frigates under construction by the end of this decade. Isuju-class ships (side numbers DE211-214, Fig. 4) have two 76mm paired gun installations, a four-barreled Bofors depth-charge launcher, two three-tubed 324mm torpedo apparatus and a four-tubed 533mm one along with depth-charge launchers. Their linear dimensions and power plants are close to those of the Tikugo-class frigates.

The largest ships are the Yamagumo- (three, see color insert) and Minegumo-class destroyers (two) built in 1966-1969.[3]

The obsolete reserve ships (six destroyers and five small ASW ships) have officially been removed from the active inventory and reclassified as auxiliary ships, but they retain their former armaments and could be returned to service. It is planned to scrap all of these ships by the beginning of the 1990s, but for now they are used for various missions in support of the activity of the Japanese fleet.

The ships of the minesweeping forces are represented by 13 land-based Takami-class minesweepers built in 1972-1978 that are considered outdated and are projected for transfer to the reserves by the first half of the 1990s with their gradual substitution with Hatsushima-class ships (from the fleet). The Takami-class sweepers have a wooden hull, a standard displacement of 380 tons, a length of 52 m, a beam of 8.8 m and a draft of 2.4 m; the twin-shaft diesel power plant of 1,440 hp allows speeds up to 14 knots; they have installed on

them Herlikon 20mm single-barrel guns, radar for the detection of surface targets, a sonar station for detecting mines and various sweeping equipment: the contact-type 67, the acoustic-type 71 (S-2) or A-Mk4V, the hydrodynamic type S-4 and the magnetic type 56. It has a crew of 45.

The Nanao-class minesweeping launches (six) carry out missions in sweeping mines in the inner water areas of roads and ports. They were built in 1973-1975 and have a standard displacement of 50 tons, a length of 22.5 m, a beam of 5.4 m, a draft of 1 m and a top speed of 11 knots. Various types of minesweeping equipment are used: the contact-type 67 or S-1, the magnetic type 56 or M-Mk5 and 6 and the acoustic A-Mk4V. There are no guns on board, and it has a crew of nine.

The minesweeping forces of the naval regions also have in reserve five land-based Takami-class and four Kasedo-class sweepers.

The amphibious forces of the naval regions are represented by five landing craft of the Atsumi (three) and Yura (two) classes, as well as 18 obsolete assault boats of the LCU (3) and LCM (15) types. The largest of these are the Atsumi-class armored-assault craft built in 1972-1977 with a capacity of 130 men with light weapons, up to ten medium tanks or 400 tons of cargo; there are also two LCVP-type assault boats for assault landings. They are armed with two 40mm paired gun mounts.

The small Yura-type assault boats were transferred by the fleet in 1981, an they have a capacity of about 70 men with standard-issue arms, up to ten five-ton vehicles or 50 tons of cargo; they are armed with a single 20mm gun.

The torpedo and patrol boats built in the first half of the 1970s are outmoded in the opinion of the Japanese command. Five PT11-class torpedo boats built in 1971-1975 have four 533mm single-tube torpedo apparatus and two single-barrel 40mm gun mounts; the top speed is 40 knots, and the effective range is 100 miles at a speed of 18 knots.

The PB19-class patrol boats entered service in the naval regions in 1971-1973. Their standard displacement is 18 tons, and top speed is 20 knots; they are armed with a 20mm Herlikon gun mount.

Prospects for development. In the interests of increasing the military capabilities of the naval regions in the five-year program for the construction of the Japanese armed forces (1986-1990), the allocation of funds is being proposed for the construction of 12 ships and small vessels, including six guided-missile frigates, three assault ships and three missile boats, as well as 15 shore-based ASW helicopters. The renewal of the ship inventory of the naval regions is also planned through the transfer of destroyers and sweepers from the fleet inventory to the extent of the arrival of new ships in it.

The "national defense program" adopted by the Japanese government in 1976 stipulates a quantitative level of 60 ships for the escort forces of the fleet. Each naval region is envisaged therein to have two divisions of such ships with three ships in each, or no fewer than 30 destroyer escorts and

frigates. The construction of six DE229-class guided-missile frigates is projected in the course of realizing the five-year program. Funds for building the first four ships have already been allocated, and the construction of the remaining ones will be financed in 1989, while the construction of all six will be completed by 1993.[4] Before the first half of the 1990s, to the extent of the arrival of new Hatakaje-, Asagiri- and other-class ships into the fleet, it is planned to transfer four Takatsuki- and three Yamagumo-class ships from the destroyer-escort squadrons to the naval regions. The gradual withdrawal to reserve or scrap of six ships is planned by the same time: four Isuju-class and two Yamagumo-class vessels. Judging from the reports of the foreign press, by the middle of the next decade the complement of the regions is planned to be some 30 ships: 2 guided-missile destroyers, 9 guided-missile frigates, 8 destroyers and 11 frigates, organizationally reduced to 10 separate divisions.

According to calculations of the Japanese Center for Strategic Research, the fleet must have no fewer than 42 minesweepers (14 divisions). The inclusion of at least six such divisions in the naval regions is proposed. The current five-year fleet-building program does not envisage a significant increase in the ship complement of the minesweeping forces of the naval regions. To the extent of the withdrawal of Takami-class ships into the reserves, it is proposed to transfer Hatsushima-class sweepers to the naval regions.

The future plans for developing the Japanese fleet call for the replacement of torpedo and patrol boats with missile boats. The program plans the allocation of funds for building the first three hydrofoil missile boats with a displacement of 65 tons. The Italian Sparviere project is considered to be the basic prototype. Proposed for installation on them are the Harpoon anti-ship missile system (four--eight launch containers), the single-barrel 76mm OTO Melara gun mount and the six-barreled 20mm Vulcan-Phalanx anti-aircraft gun. The boat is projected to enter service in 1992-1993. It is proposed that the naval regions have a total of up to 30 missile boats (one or two divisions per naval region), according to data of the Japanese Center for Strategic Research.

In the interests of developing the amphibious forces of the naval regions of Japan, the construction of small assault ships with a displacement of 420 tons has begun. The entry into service of the lead ship is planned for this fiscal year. The allocation of funding for building another two such ships is projected before 1990. It is proposed that each naval region have two or three such assault ships in the future.

It is proposed to bring the quantity of shore-based ASW helicopters to 54, organizationally reduced to six air squadrons, by the beginning of the 1990s. It is proposed that eight-ten HSS-2B helicopters be stationed at the airbases at Ominato, Tateyama, Komatsushima, Omura, Naha and Kanoya.

According to estimates of foreign military specialists, the five-year program for building up the fleet will permit the Japanese command to expand substantially the capabilities of the naval regions. In a quantitative regard, the ship inventory of the naval regions will increase by 25 percent, while the fleet of shore-based ASW helicopters will grow by 40 percent.

FOOTNOTES

1. For more detail on the constituent elements of the Japanese Fleet and its missions see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1985.--No 6.--pp 65-71; No 3.--pp 47-55; No 2.--pp 63-64. Ed.
2. For more detail on Japanese guided-missile frigates see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1986.--N 11.--pp 60-62. Ed.
3. For more detail on Japanese Yamagumo- and Minegumo-class destroyer-escorts see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1986.--No 3.-- pp 50-53. Ed.
4. For more detail on DE229-class vessels see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1986.--No 11.--p 62. Ed.

12821
CSO: 1801/201

NAVAL HELICOPTERS OF THE PRINCIPAL NATO COUNTRIES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 54-60

[Article by Col (Res) I. Kutsev: "The Naval Helicopters of the Principal NATO Countries"]

[Text] The naval command of the countries of the aggressive NATO bloc, and first and foremost the United States, are constantly increasing the combat capabilities of their fleets and naval aviation in their attempts to achieve superiority over the Soviet Navy and the navies of the other countries of the socialist community. Considerable attention is being devoted to the qualitative improvement of helicopters, especially those for anti-submarine warfare [ASW], which are a component of a ship's weaponry. It follows from a multitude of materials and statements of specialists of various ranks published in the foreign press that a qualitative improvement of the naval helicopter inventory of the leading countries in the North Atlantic alliance in the last decade has been accomplished not so much through the incorporation of new helicopters into the fleet as through the modernization of those now in service.

At the beginning of the 1970s, large-scale and long-term modernization programs for helicopters put into service at the end of the 1960s and early the 1970s were developed in the United States and other Western countries.

These plans called in particular for improving or replacing on-board helicopter systems, as well as armaments, make possible an effective fight not only against submarines, but also enemy surface vessels along with target-designation missions. In the opinion of American specialists, this makes it possible to extend the service life of already outmoded helicopters. It is also felt that such a modernization would meet the criteria of "cost-effectiveness," since it would be less expensive than creating new and costly aircraft that would furthermore require a great deal of time. American specialists, for instance, needed about 15 years to develop the shipborne SH-60B Sea Hawk helicopter with the LAMPS Mk3 system (see color insert).

A new class of helicopter was developed in the British Navy in 1982--the Sea King-HAEW.2 long-range radar detection (LRD) helicopter--that is used with the Invincible-class ASW aircraft carrier.

Principal Tactical and Technical Features of U.S. Naval Helicopters

-----------------------------1st half of table-----------------------------

Helicopter: [see key following]	(1)	(2)	(3)	(4)	(5)
--Crew	3	3	4	4	2
--Number of gas-turbine engines	2	2	2	2	1
--Power, hp	1,350	1,700	1,400	1,400	2,100
--Mass, kg: empty	3,040	6,200	4,430	4,500	3,600
maximum take-off	5,800	9,900	9,500	9,530	6,350
--Top speed at sea level, km/hr	275	250[1]	270	270	280
--Rate of climb, m/sec	12.4	6.0	13.0	13.0	9.0
--Maximum range, km	680	600	1,000	1,000	400
--Practical ceiling, m	6,860	5,790	5,400	5,400	---
--Total length, m	16.0	19.8	22.6	22.6	17.7
--Total height, m	4.7	5.1	5.1	5.1	4.3
--Main rotor blades, no.	4	4	5	5	2
diameter, m	13.4	16.4	18.9	18.9	14.6
--Armaments and basic equipment [see key]	(a)	(b)	(c)	(d)	(e)

-----------------------------2nd half of table-----------------------------

Helicopter: [see key following]	(6)	(7)	(8)	(9)	(10)
--Crew	2	3	3	3	1-2
--Number of gas-turbine engines	2	2	2	3	1
--Power, hp	1,700	1,870	3,695	4,380	1,250
--Mass, kg: empty	4,000	5,900	10,700	14,900	2,360
maximum take-off	6,500	10,570	19,000	33,300	4,310
--Top speed at sea level, km/hr	over 280	270	315	315	220
--Rate of climb, m/sec	---	9.6	11.0	14.0	8.0
--Maximum range, km	---	300	400	2,000[2]	510
--Practical ceiling, m	---	---	6,400	5,640	3,840
--Total length, m	17.7	13.8	26.9	30.2	17.5
--Total height, m	4.3	5.1	7.6	8.7	4.4
--Main rotor blades, no.	2	6	6	7	2
diameter, m	14.6	15.3	22.0	24.0	14.2
--Armaments and basic equipment [see key]	(f)	(g)	(h)	(i)	(j)

Key to helicopters in table:

Multipurpose:
1--SH-2F Sea Sprite with LAMPS Mk1 system (1971)
2--SH-60B Sea Hawk with LAMPS Mk3 system (1984)
ASW:
3--SH-3D Sea King (1966)
4--SH-3H Sea King (1974)
Fire-support:
5--AH-1T Sea Cobra (1975)
6--AH-1W Super Cobra (1986)
Assault-transport:
7--CH-46E Sea Knight (1968)
8--CH-53D Sea Stallion (1968)
9--CH-53E Super Stallion (1978)
10--UH-1N Iroquois (1972)

Key to armaments and basic equipment:

a--2 Mk46 torpedoes, 15 sonobuoy dispensers, AN/ASQ-81 magnetic detector, LN66HP search radar, AN/ALR reconnaissance receiver
b--2 MK46 or Mk50 torpedoes, 25 sonobuoy dispensers, AN/ASQ-81B magnetic detector, AN/APS-124 radar, AN/ALQ-142 radio station, AN/AYK-14 computer
c--4 Mk46 torpedoes or depth charges, AN/AQS-13B sonar
d--4 Mk46 or Mk50 torpedoes, depth charges, AN/AQS-13B sonar, 25 sonobuoy dispensers, LN66HP radar
e--Three-barreled 20mm cannon on a turret mount, launch mounts with 70mm rockets, 8 TOW guided antitank missiles
f--8 Hellfire or TOW guided antitank missiles, 2 AIM-9L Sidewinder air-to-air missiles, a 20mm cannon, 76 rockets
g--Up to 25 men or 1,900 kg of cargo
h--Up to 38 men or 3,600 kg of cargo
i--Up to 56 men or 14,000 kg of cargo in the cargo cabin or 16,000 kg of cargo on external suspension
j--Up to 14 men or cargo of small mass and size

Footnote 1--cruising.
Footnote 2--ferrying.

In the United States, fire-support helicopters have been modernized and transport assault helicopters have been improved.

The table presents the principal technical and tactical features of the present and prospective helicopters in service of the U.S. Navy.

The helicopter fleet of naval aviation has traditionally been allotted first place in importance of mission and number of combat personnel to ship-based ASW helicopters. It is noted that this class of helicopters has been supplemented with new classes of aircraft to a quite inconsiderable extent over the last 20 years and more. Surface vessels today (frigates, destroyers, cruisers) are equipped primarily with light multipurpose SH-2F Sea Sprite helicopters with the LAMPS Mk1 system, and multipurpose aircraft carriers have

SH-3H Sea King helicopters that were put into service at the beginning of the 1970s. They were created on the basis of preceding versions that were developed using equipment and technology from the end of the 1950s and early 1960s, and they have been modernized repeatedly under various programs in the course of operations.

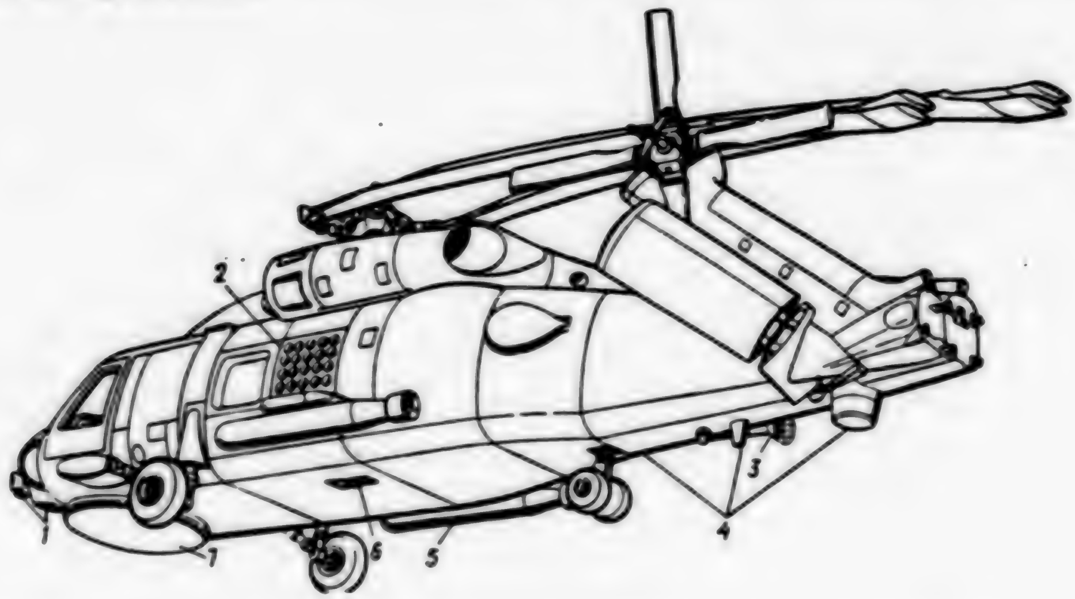

Fig. 1. SH-60B helicopter with retracted main rotor blades and tail boom: 1--data-transmission device antenna; 2--air-powered radar sonobuoy launcher; 3--towed magnetic detector; 4--radio-reconnaissance and data-transmission equipment antenna; 5--Mk46 torpedo; 6--helicopter probe, lowered for use when landing with the aid of the RAST system; 7--AN/APS-124 radar radome

Multipurpose helicopters. The SH-2F helicopter, as series produced, and the SH-2D, re-equipped into the SH-2F, are equipped with two more powerful and economical gas-turbine engines (GTE) with 1,350 hp [horsepower] each. Modern submarine and surface-vessel search and detection equipment has been installed on them (15 hydro-acoustic radio buoys (passive and active), the AN/ASQ-81 magnetic detector and the Canadian-manufactured LN66HP radar), an AQS-902 acoustic signal processor, an AN/ALR-54 reconnaissance receiver and an AN/ALE-66 jamming (RES) station. The equipment on the helicopter also allows it to issue target designations for strikes against enemy ships using anti-ship missiles (ASM), including cruise missiles, which makes it multipurpose.

In 1983 the series-produced SH-2F helicopters were renovated, as reported by the foreign press, in connection with an intention to equip Garcia-, Knox- and Brook-class frigates with them, since the new SH-60B helicopters arriving in the fleet could not be based on ships of this type due to their dimensions and weight. The additional production of 54 aircraft was planned. Furthermore, according to reports in the American press, a version of the helicopter had been developed and designated YSH-2F on which two more powerful T700-GE-401 gas-turbine engines had been installed with a maximum power of 1,700 hp along with modern radio-electronic equipment.

The new multipurpose SH-60B helicopter, which had been under development since the beginning of the 1970s (Fig. 1), entered service with naval aviation in 1984. It is based on the U.S. UH-60A multipurpose ground-forces helicopter. Five experimental prototypes were built, and flight testing of the first one began in 1980. Flight testing of the pre-series models was conducted over 1983-1984. Before they were placed in service on combat ships (Oliver H. Perry-class guided-missile frigates, Spruance-class destroyer-escorts and Ticonderoga-class guided-missile cruisers), the helicopter underwent comprehensive testing under maritime conditions for 170 days, made more than 1,000 landings and accumulated about 600 hours of flying time. The program envisages the procurement of some 240 helicopters for the naval forces overall and the arming of 105 ships with them.

Two economical T700-GE-401 gas-turbine engines with a maximum power of 1,700 hp have been installed on the SH-60B. It is equipped with 25 sonobuoy launchers mounted on the left side of the fuselage, an AN/AQS-81 (towed) magnetic detector fastened to the right side, an AN/APS-124 surface and airborne target detection radar, a fairing for the antenna system located under the fuselage between the landing-gear struts, a radio-reconnaissance apparatus (RRA) with four rectangular antennas: two under the crew compartment and two along the sides of the fuselage. Furthermore, a sonobuoy signal receiving and data transmission apparatus has been installed on the helicopter, along with an AN/UYS-1 Proteus processor to process the data. The on-board helicopter apparatus is joined with a combat-information post on the carrier ship from which the helicopter is controlled in the fulfillment of its combat assignments. The helicopter crew is the pilot (commander), co-pilot (tactical officer) and operator.

In creating the helicopter, much attention was devoted to ensuring high combat readiness in taking-off and landing on the deck of the ship.

The safety of helicopter operations from a ship is ensured with the RAST system (Recovery Assist Secure and Traverse), with the aid of which the landing, tying down and movement of the helicopter to the hangar of the ship in ocean roughness over 4 (Fig. 2) are accomplished. The time for tying down the helicopter to the moving apparatus from a state of hovering is only a few seconds. All operations of the system for supporting the helicopter landing on the ship (with the exception of joining the helicopter hawser to the support ship's landing line) are automated.

The principal ASW weapon of the ship is the small Mk46 torpedo, which is planned to be replaced by the Mk50, which in the final stages of development. Aside from fighting submarines, the helicopter is used for target designation as well. The possibility of using it to fight surface ships as well are being studied. According to reports in the foreign press, in 1982 the U.S. Navy studied and evaluated the technical and operational capabilities of the Norwegian Pingvin Mk2 anti-ship missile. The possibility of using it with the SH-60B helicopter is currently being studied. British firms are also taking part in this work for the purpose of arming the British Sea King-HAS.5 and Lynx-HAS.2 helicopters with this missile. Research has shown that mounting two Pingvin missiles (start weight of about 140 kg and length of 2 m) on the Sea King-HAS.5, notwithstanding the increase in its maximum take-off weight,

makes it possible to conduct combat operations in a radius of 160 km from the carrier ship with the availability of enough time to detect and classify the target and track it.

The American firm of Grumman is engaged in installing these missiles on the SH-60B helicopter. Their launch mounts are planned to be located on the same hangers as the torpedoes go on. Specialists of the firm feel that the fins of the Pingvin Mk2 Model 3 missile must be made retractable. Furthermore, a two-stage solid-fuel smokeless motor and device for slowing the ignition of the fuse in the detonation system are essential so that the missile is at a safe distance from the helicopter when the motor begins to operate. The motor provides for a speed of up to Mach 0.8 for the missile that is maintained for the whole flight. The missile can be launched at altitudes of 30-150 m at a helicopter airspeed of over 185 km/hour.

A number of problems arose in the creation of the SH-60B helicopter concerning its accommodation on established classes of ships, which forced the naval military specialists to reconsider the plans and, as a consequence, lengthen the time periods, as well as increase the cost, of the whole program. According to the estimates of foreign specialists, the SH-60B helicopters and the carrier ships represent a unified combat system that meets the requirements of the 1990s.

Eight helicopters of this type that differ from the American SH-60Bs in equipment and armaments were purchased by the Australian Navy. It is planned to equip them with the Super Searcher radar for the detection of surface targets from the firm of MEL along with anti-ship missiles. It is furthermore being reported that an SSQ-801 sonobuoy and a processor for signals received from the Barra buoys, as well as a magnetic detector, will be installed on the helicopters.

Two SH-60B helicopters (without on-board equipment) were purchased by Japan. They are equipped with Japanese-made apparatus for flight testing. The helicopters, which have received the designation SH-60J, will be built by the firm of Mitsubishi to replace aging Sea Kings at the beginning of the 1990s.

ASW helicopters. The modernization program envisaged the re-equipping of about 300 Sea King helicopters of predecessor versions into SH-3H helicopters and leaving them in service at least until the middle of the 1990s. To raise their ability to fight modern submarines and detect surface ships, the helicopter is being equipped with the AN/AQS-13B retractable sonar, 25 sonobuoys, the AN/ASQ-81 towed magnetic detector and the LN66HP search radar, an antenna system fairing that is housed under the fuselage (behind the sonar), as well as radio reconnaissance equipment. It is also equipped with an AN/ALE-37 installation for creating passive interference.

The principal weapon of the helicopter remains the Mk46 torpedo (up to four), which are planned to be replaced gradually by the new Mk50. Since the airframe is reaching the limits of its working life for that portion of the aircraft that were of earlier manufacture, several assemblies and parts in its structure are being strengthened in the modernization process. Furthermore, the helicopters are being equipped with modern devices for various purposes

during the modernization as well. Particular attention is being devoted to the operational reliability of all on-board systems and increasing the run time between failures. Despite the steps being undertaken to increase the combat capabilities and lengthen the service life of the SH-3H helicopters, however, military specialists have expressed their apprehension that they will hardly be able fully to meet the requirements of waging war with submarines in the 1990s. These apprehensions are also dividing the U.S. Navy command, at the direction of which as early as the beginning of the 1980s a number of plans were studied and evaluated for helicopters from various American and European firms for the purpose of selecting the simplest for replacing the SH-3H in the 1990s. According to the data of the American press, the specialists preferred the plan of Sikorsky, which received the designation of SH-60F (earlier the SH-60C Sea Hawk) and was a modernized version of the multipurpose SH-60B Sea Hawk helicopter with the LAMPS Mk3 system. A contract was concluded with the firm in the spring of 1985 valued at 50.9 million dollars for its full-scale development. Judging by the materials of the foreign press, the procurement of 175 such helicopters is envisaged for the navy, the first seven of which are projected to be produced in 1987.

Fire-support helicopters. These have been aircraft for the Marines since the middle of the 1960s; they are used in conjunction with ground-attack aircraft or independently in assault operations, as well as the fulfillment of other missions. The first prototypes were the UH-1E Iroquois and the AH-1G Huey Cobra helicopters, re-equipped versions of light multipurpose helicopters armed with 7.62mm machine guns, grenade launchers, 70mm rockets and the corresponding simplified sighting systems. At the beginning of the 1970s, the improved AH-1J and AH-1T Sea Cobra helicopters were produced for the marines, armed with a three-barrel 20mm cannon in a turret mounting, 70mm rockets and TOW antitank guided missiles (AH-1T).

Development was completed in 1986 of the AH-1W Super Cobra fire-support helicopter, a modernized version of the AH-1T Sea Cobra. According to the testimony of the Western press, it has better tactical and technical features, greater reliability and longevity and quite powerful armaments (through the two more economical T700-GE-401 gas-turbine engines, the total power is 3,400 hp, which is 1,300 hp more than the power of the engines in the AH-1T Sea Cobra helicopter). The helicopter can carry armaments in the following variations: eight Hellfire or TOW guided antitank missiles; four cannon mounts, each with 19 70mm or four 127mm rockets; a turret mount below the nose of the fuselage with a 20mm cannon and one cannon of the same caliber in containers on pylons under the stub-wings. For the first time abroad, moreover, this helicopter is being armed with the AIM-9 Sidewinder air-to-air missile, largely for fighting enemy helicopters.

Improvement of the helicopter weapons control system and the development of night-vision apparatus for it is continuing.

Assault transport helicopters, making up a group that is organizationally an air wing, are intended for the transfer of assault personnel, weapons and various types of material and technical supplies from ship to shore. They are also used for the rapid delivery of various types of cargo to ships and the movement of personnel from ship to shore and back. Heavy-lift helicopters are

also employed for transporting aircraft and other expensive types of equipment that are out of commission from aircraft carriers.

As reported by the foreign press, over the last twenty years (since 1966) the U.S. Navy has not created a single new type of helicopter in this class. Two principal types continue to remain in service, the CH-46E Sea Knight and the CH-53E Super Stallion, both being modernized versions of predecessor models of helicopters adopted for service in the middle of the 1960s.

The Sea Knight helicopter, as opposed to the others, has two rotors disposed in a tandem scheme. The first modification helicopter--the CH-46A--had two T58-GE-8B turboshaft engines with a maximum power of 1,250 hp each, while the CH-46D helicopter had F-T58-GE-10 engines with 1,400 hp. Some 624 of this version were produced overall up to 1971 inclusive for Marine aviation, including 48 helicopters under the designation UH-46, ordered by the naval air command for transporting cargo to ships. The re-equipping of 273 helicopters into CH-46E models began in 1975, and they were equipped with 1,870-hp T58-GE-16 engines. In order to prolong the operational life of the helicopters, particular attention was devoted to increasing the reliability of all systems and on-board equipment via their improvement or partial replacement. The metallic blades of the rotors were replaced with fiberglass blades on 360 aircraft.

The heavy CH-53A helicopter was brought into service in 1965, as was the CH-53D in 1968. The latter has two T64-GE-413 engines, a cargo compartment calculated for the transfer of 38 assault soldiers with their weapons or 3,600 kg of cargo. The CH-53D has been equipped with a modern cargo loading and unloading system via a ramp that permits a single man to handle 1 ton of cargo a minute. The production of these helicopters was halted in 1972. Some 265 aircraft were produced overall.

The series production of the "super-heavy-lift" CH-53E Super Stallion--an improved version of the CH-53D--began in 1978. At the beginning of 1985, the marines and naval aviation were supplied with 80 helicopters and an additional order for 93 more was confirmed. According to the foreign press, series production will continue into the 1990s. They will be used by the navy to supply various stores to surface ships from a hovering position and to transport damaged planes from aircraft carriers.

The CH-53E, as opposed to predecessor models, has been equipped with three more powerful engines with a total power of 13,140 hp. The number of blades on the main rotor has been increased from six to seven; the diameter of the rotor has also been enlarged. All of this has made it possible to bring the take-off weight of the helicopter to 33,300 kg, the weight of cargo shipped in the cabin to 14,000 kg and that shipped on the two-point external suspension to 16,000 kg.

A number of improvements have recently been made to the helicopters. The rotor hub has been manufactured from composite materials, while titanium spars have replaced fiberglass ones. The blade tips have a 35- and 15-degree sweep, which makes it possible, in the opinion of foreign specialists, supposedly to increase the weight of the useful load of the helicopter in a hovering mode by

roughly 1,360 kg. The blades of the tail rotor have also been made from composite materials. The power of the T64-GE-408 turboshaft engine has been increased, and an electrical (instead of hydraulic) system for folding up the tail boom along with the tail rotor has been developed.

The Omega navigational system, a device to warn the crew of proximity to the ground in flying at low altitudes and at night, a device for decreasing the infrared emissions of the engine exhaust-gas stream, a launcher for firing radar chaff, infrared traps and other equipment are all under development. According to data in the American press, it is planned to arm the helicopter with AIM-9 Sidewinder missiles, the first test launches of which have already been conducted, for self-defense.

The MH-53E Sea Dragon minesweeper helicopter was developed based on the CH-53E Super Stallion. Flight testing of the pre-series-production prototype began at the end of 1983. The procurement of 57 such helicopters for the navy is envisaged, and delivery will be made starting in 1986.

The UH-1 Iroquois helicopter is the transport version of the obsolete multipurpose Iroquois helicopter and is used in the marines for the transfer of small cargo that is not very heavy along with personnel.

Considering that the capabilities of helicopters in achieving maximum speed and cargo capacity are limited by the specific nature of their design, American specialists, after prolonged large-scale research on aircraft with vertical or short take-off and landing that have varying designs, purposes and basing locations, have decided to develop the multi-purpose subsonic V-22 Osprey STOL [short take-off and landing] aircraft with pivoting engines (initial designation JVX) for the armed forces based on the experimental VX-15 aircraft.

According to data in the foreign press, the base V-22 aircraft should have take-off weight of about 20,000 kg, a maximum speed of 510 km/hour, a flight range of 2,600 km and a hover ceiling of 900 m (with a useful load of 3,760 kg and ambient air temperature of 33 degrees Celsius, without influence from the effect of the earth). Up to 24 soldiers with their weapons can be accommodated in the cargo cabin. Out of 1,213 aircraft that should be procured by the armed forces, 552, under the designation MV-22A, are projected for delivery to marine aviation and 50 more to naval aviation. The full-scale development of this aircraft began in 1985. According to data in the American press, it is planned gradually to replace first and foremost the CH-46 helicopters in marine aviation with the V-22 at the beginning of the 1990s. In naval aviation they will be used first and foremost for search-and-rescue operations. The possibilities for using the V-22 to fight enemy submarines and as a long-range radio beacon aircraft are being studied.

12821
CSO: 1801/201

CENTRALIZED AIRCRAFT REFUELING SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 67-71

[Article by Lt Col and Candidate of Technical Sciences N. Syroyedov and Lt Col (Res) A. Rozhkov: "A Centralized Aircraft Refueling System"]

[Text] Centralized aircraft refueling systems (CARS) or, as they are called in the West, hydrant refueling systems, have been utilized more and more widely abroad in recent years. The simultaneous refueling of several aircraft right on the hardstands or in special areas where they are being prepared for flight is possible.

The centralized method of refueling, notes the foreign press, is progressive and most fully meets the requirements for operating current and prospective aircraft fleets. CAR systems are widely employed not only at major airports in the United States, Great Britain, France, Italy, Japan, Canada and other countries, but at their military airfields as well. In the United States, for example, airbases for naval and air-force aircraft have been equipped with them since the 1970s.

The attention of foreign military specialists toward CAR systems was aroused by the fact that they have a number of advantages over traditional refueling trucks. First of all, such systems make it possible to refuel simultaneously several aircraft quickly, which facilitates a reduction in the time periods for preparing them for repeated flights and raises combat readiness. Second, they provide for a more economical means of delivering fuel from storage tanks to aircraft fuel tanks thanks to the use of pipelines. Third, the labor-intensiveness of fuel pumping within the airport is reduced through the elimination of an intermediate stage--loading the refueling trucks--and the integrity of the system eliminates the possibility of polluting the fuel with mechanical impurities and atmospheric residue. The incorporation of CAR systems at airports furthermore makes it possible to reduce the number of service personnel, raise the level of automation and mechanization of the refueling process and create beneficial fire-prevention conditions, since there are no trucks loaded with fuel on the aircraft hardstands.

At the same time, NATO experts note that the incorporation of CAR systems at airports also entails considerable capital investment for the construction of

the structures and equipment that makes up the system. In this regard, fixed CAR systems are being constructed at those airports where the expediency of their creation is substantiated by military, economic and operational indicators.

Table 1
Basic Technical Data for CAR Systems

----Airport---- (city, country)	---Technical Data---					
	Storage tank capacity, cubic m	Diameter of pipelines, millimeters	System productivity, cubic m/hr	Number of hydrant wells	Refueling unit capacity, lit/min	Number of types of fuels handled
(1)	9,000	250-450	1,100	---	2,250	2
(2)	9,000	100-400	1,200	46	2,000-5,000	2
(3)	9,000	100-400	1,200	342	2,000-5,000	2
(4)	4,000	300-450	---	152	---	2
(5)	5,000	100-300	1,440	182	---	3
(6)	4,800	150-350	---	44	---	2
(7)	15,000	100-400	1,240	43	2,000-4,400	5
(8)	---	250-400	1,200	30	2,000-5,000	2
(9)	26,500	---	2,280	193	---	---
(10)	3,200	300-500	1,300	54	2,000-4,400	3

Key to airports:

1--Heathrow (London, Great Britain)
2--Orly (Paris, France)
3--Charles de Gaulle (Paris, France)
4--Castrule (Copenhagen, Denmark)
5--Fumicino (Rome, Italy)
6--Hellinikon (Athens, Greece)
7--John F. Kennedy (New York, United States)
8--Dulles (Washington, United States)
9--O'Hare (Chicago, United States)
10--Toronto (Canada)

Several types of highly productive automated fixed centralized aircraft refueling systems are currently being employed abroad. The presence of a separate set of structures and equipment is essential for each of them.

The principal technical features of the contemporary CAR systems used in Western countries are presented in Table 1.

Depending on the type of aircraft being serviced, the intensiveness of flights and the needed quantity of fuel in refueling, as well as the number and disposition of the CAR system aircraft hardstands, the productivity and quantitative make-up of the equipment differ. Notwithstanding these distinctions, however, the CAR system complex of structures and equipment, as a rule, includes: tanks for storing supplies of fuel, a pipeline network with stopping and regulating fittings, pumping stations for feeding the fuel into the pipeline network, filtration stations to clean the fuel of mechanical impurities and water, mobile or fixed refueling units for rapid hook-up of the CAR system to aircraft fuel tanks, as well as to maintain the refueling regimen in consumption and pressure and to measure the quantity of fuel, equipment for the remote control and monitoring of system operation and fire-extinguishing and static-electricity discharge equipment.

The tanks of the airport storage area for fuels or tanks especially installed for the purpose are used as storage for the CAR systems. The number of tanks and their overall capacity is determined in each specific instance. In foreign practice, highly productive fixed CAR systems are most often equipped with conical-bottomed vertical or horizontal metal tanks. They have an internal corrosion-resistant coating that resists the effects of petroleum products and water.

The pipeline networks of CAR systems can be executed in an end-point, circular or combined scheme. Preference is given to the two latter ones, since it is felt that they provide higher operational reliability. End-point systems are usually used in CAR systems that have low productivity. Depending on the climatic conditions and the requirements on the systems, the pipeline networks at airports and airfields are built either underground or on the surface. Seamless and welded pipe are used for the pipeline networks with inner and outer corrosion-resistant coatings.

The pumping stations in the process layouts are located right at the tanks. The number of pumps installed in them depends on the quantity of fuel to be pumped.

Most common are pumping stations with a group of centrifugal pumps installed in parallel that are turned on automatically to the extent of increase in the quantity of fuel being pumped to the aircraft simultaneously. In order to raise the reliability and longevity of the CAR systems at such stations, reserve pumps are installed as a rule aside from the working pumps.

Military and civil technical standards stipulate strict requirements for the quality of fuel pumped from the CAR systems for refueling. Every airfield system thus envisages the three-stage filtration of the fuel from mechanical impurities and the removal of excess water from it. At the first stage, the

mechanical impurities and water are removed from fuel entering the airfield storage tanks from transport, at the second--from fuel pumped from the storage tanks to the refueling units and at the third--from the fuel being fed into the aircraft fuel tanks. All of these operations are accomplished by preliminary (coarse) and separation (fine) filters.

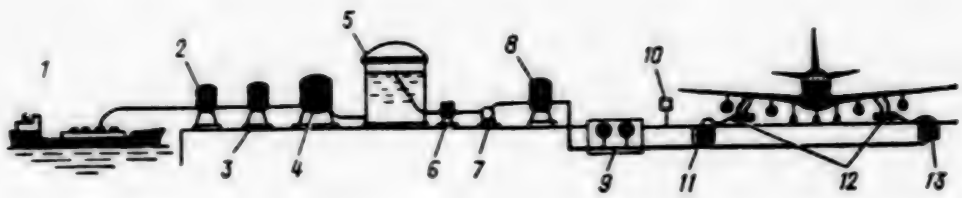

Fig. 2. Diagram of the layout of the structures and equipment of an airport centralized aircraft refueling system: 1--fuel receiving from a barge; 2--air separator; 3 and 6--preliminary cleaning filters (gauze); 4 and 8--separation filters; 5--storage tank; 7--pump; 9--pneumatic shock absorber; 10--emergency shut-off; 11 and 13--hydrant wells; 12--refueling units.

The firms specializing in the manufacture of refueling equipment for military and civil departments, especially Faudi of West Germany, produce separation filters that ensure the cleansing of mechanical impurities from the fuel with a fineness of 1 micrometer and practically 100-percent removal of excess water. Quality control is accomplished with the aid of instruments that cut off the feed of fuel to refueling in the event they detect increased mechanical-impurities or free-water content and divert the flow to pass through repeat filtration.

The final element in the CAR systems is the refueling unit or fuel-pumping hydrant unit. The fuel is fed from the pipeline network through them into the aircraft tanks. Refueling units with a throughput capacity of 1,300 to 4,500 liters/minute in mobile and fixed forms are manufactured under orders from military departments and commercial airlines by the foreign firms of Remtech and Westenc-Willock (both in Canada), Faudi (West Germany), Viberti (Italy), Fuji Heavy Industries (Japan) and Edhill (Great Britain).

The mobile units are mounted on truck chassis, self-powered trolleys and trailers. The units on trucks are usually used at airports with high flight intensiveness.

The principal technical data for the refueling units made by Viberti (produced on a truck chassis) are presented in Table 2.

The unit, mounted on a Fiat 40F8 truck, is equipped with a working platform with hydraulic drive that rises to a height of 3.1 m [meters]. This makes it possible to use the unit in refueling military and civil aircraft that have high-mounted nozzles.

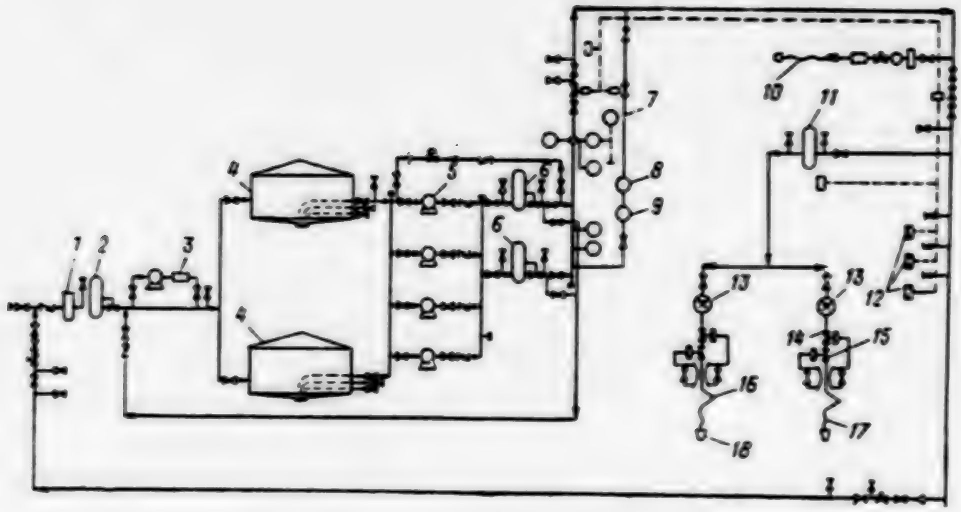

Fig. 3. Diagram of a CAR system used at American military airfields: 1--preliminary fuel cleaning filter; 2, 6, and 11-separation filters; 3--automatic quality monitoring device; 4--storage tanks; 5--pumps; 7--fuel consumption sensors; 8--automatic pump start-up (shut-off) device; 9--automatic start-up device for first pump; 10--device for filling refueling trucks; 12--refueling station; 13--fuel-flow meter; 14--primary pressure regulator; 15--secondary pressure regulator; 16--hose feed device; 17--refueling hose; 18--terminal of a shut-off refueling station

The fixed units are installed, as a rule, on a metal frame and can be installed on the ground or underground, wherein the latter are most widely used in the CAR systems of military airfields.

The structures and equipment of CAR systems at airports and airfields are disposed in a definite sequence with a regard for the relief of the terrain and the codes stipulated in the given country that define the allowable distances between the structures and equipment of CAR systems and other airfield facilities. At the same time, judging by the data of the foreign press, the CAR systems employed at airports and the ones used at military airfields do not differ materially in design execution, make-up of process equipment or principle of operation.

At Haneda International Airport in Tokyo, for example, the storage facilities (total fuel capacity of 22,000 cubic meters) consist basically of vertical steel tanks in which aviation fuel of several types along with aviation gasoline can be stored (Fig. 2). Fuel is taken into the storage tanks from barges. A pier has been built in the Tama River for this purpose at which three barges can dock and tie up simultaneously. The fuel from the barges, before going into the storage tanks, passes through an air cleaner, preliminary filtration (gauze) and a separation filter. Analogous schemes for receiving fuel are also employed at several air-force and naval airfields in the United States. It is pumped from the tanks (there are 11 pumps in all in

the pumping station) to the underground pipeline network through separation filters, monitoring and regulating instruments and refueling units directly into the aircraft tanks. The throughput of the systems exceeds 2,000 cubic meters/hour. This is sufficient to refuel five Boeing 747 aircraft simultaneously.

A corresponding group of pumps provides for the refueling of aircraft with specific fuels. The pumps are started and stopped automatically, and their operation and the system overall are monitored with the aid of instruments installed at the dispatching station.

Table 2
Principal Technical Features of Refueling Units

Features	Truck chassis	
	Fiat 80F13	Fiat 40F8
Throughput capacity, lit/min	2,270	3,785
Dispensing hose on drums: number x length (m) x diameter (mm)	2 x 30 x 64	2 x 30 x 64
Dispensing hose on platform: number x length (m) x diameter (mm)	---	2 x 4 x 76
Dimensions, m:		
Length	5.37	6.5
Width	2.3	2.3
Height	2.64	2.64
Total mass, kg	8,200	8,500

Direct refueling of aircraft is accomplished on the hardstands, which are equipped with hydraulic wells. The final elements of the CAR system--the mobile refueling units--are attached to the hydraulic wells depending on the type of aircraft being serviced.

Fixed or assembled and disassembled CAR systems are used at foreign military airfields. Of fixed ones, most widespread in the armed forces of the United States are the standard process layout of centralized aircraft refueling at permanent basing airfields (Fig. 3). Its principal virtue, in the opinion of American specialists, is the fact that is allows variation of the number of refueling units depending on the types and number of aircraft being refueled simultaneously. The necessary productivity is attained herein through changing the number of pumps hooked up. The foreign press notes that a system with this process layout can provide for the refueling of military aircraft of all types with any grade of fuel.

This system uses four pumps, and the productivity of each in pumping fuel is 1,895 liters/minute at a pressure of 10 kilograms/square centimeter. The

total pumping speed is sufficient for the simultaneous refueling of six tactical fighters. Fuel reserves are housed in two metal tanks with a capacity of 4,770 cubic meters that can be installed in the open or under cover. The pipeline network of the system is made from pipe 102-305 mm in diameter and is 6.5 km long (from the tanks to the refueling stations). The possibility of employing pipe of various materials, including carbon steel (with inner and outer anti-corrosive coatings), fiberglass and aluminum, for the CAR systems is being considered. The system is fully automated. Sensors of fuel consumption and devices to turn on (off) pumps and to start up the first pump automatically, as well as other instruments and stopping and regulating fittings, have been installed on the delivery line.

The refueling of aircraft is carried out at refueling stations, each of which has two identical fixed refueling units, rather than at their hardstands. A separation filter and a device to monitor the quality of the fuel automatically have been installed at the entry to the station. The distance between the refueling units of the same refueling station makes it possible to accommodate two fighters or one heavy aircraft of the C-5 or Boeing 747 type.

Fuel is shipped to the airfield storage tanks by various types of transport and in accordance with the system for supplying troops with fuel adopted for the given theater of operations. Another method of feeding fuel has currently been adopted in Great Britain, the United States and other NATO countries--the combined utilization of pipeline transport and mobile refueling equipment (refueling trucks, tank trucks). In the Central European theater, for example, a network of military pipelines with a total length of over 6,300 km on which over 100 trunk pumping stations have been installed has been created to supply fuel to the troops.[1] It provides fuel for more than 60 airfields that support the NATO armed forces in the given theater. There are also civilian pipelines that could be used by units and subunits of the combined armed forces of the bloc in the event of war.

Air-portable refueling systems that can be assembled and disassembled have been created by the United States and the bloc allies for refueling helicopters and aircraft that are operating at field airbases and landing areas. As a rule, the are used to equip airfields on alien territory that are intended to support the air shipment of troops and cargo. They usually include a pump with an internal-combustion engine for power, a separation filter, suction-intake and dispensing hoses equipped with fast-action joints, monitoring and measuring instruments and service tanks manufactured of elastic materials.

During the U.S. aggression in Vietnam, the Americans employed the FARE refueling system, which can be assembled and disassembled, to refuel Army helicopters in the course of combat operations, which made it possible to refuel two helicopters simultaneously with a fuel feed of 189 liters/minute. The refueling was moreover carried out at landing areas located right in the area of combat operations. The FARE used standard soft-shelled containers with a capacity of 1,893 liters or 2,770-liter tanks as service tanks. The transfer of the system to the combat zone was accomplished by helicopter (in the cargo cabin or on outside suspension).

A hydrant fuel system that can also be disassembled and transported in C-130 aircraft was developed in the United States to refuel tactical aircraft. It consists of three autonomous modules, each of which provides for the simultaneous refueling of two aircraft (the fuel feed rate is 378 liters/minute in open refueling and 1,135 liters/minute in closed refueling). The fuel intended for refueling is accommodated in rubber tanks with a capacity of 37,850 liters. All of the equipment of the module is mounted on a trailer frame.

As noted by foreign military specialists, the systems that can be disassembled, developed per assignment of the U.S. Navy for refueling aircraft and other combat equipment of the Marines, are of definite interest. A specific feature of them is the fact that in deploying the equipment on the terrain, it fulfills the functions of a refueling system that can be assembled and disassembled, while when it is mounted on a truck, it can be a refueling truck. It consists of two units: a storage tank unit and a dispenser. The latter equipment is mounted on a frame and includes the principal elements of the system (a pump with an engine, a separation filter, a meter and other elements). The dispensing unit can pump fuel at a rate of 378 liters/minute, as well as remove it from aircraft fuel tanks (321 liters/minute). The storage unit is a rubber storage tank with a capacity of 4,126 liters that is reinforced with an outer metal frame.

The whole refueling system can be transported by a CH-53D assault-transport helicopter, either in the cabin or suspended outside. The placement of five storage tanks and a single dispensing unit on a standard M172 tractor-trailer chassis turns the system into a refueling truck with a capacity of 20,630 liters and a dispensing productivity of 378 liters/minute.

This technical equipment, as reported in the foreign military press, can provide for the timely refueling of aircraft either in peacetime or in war. At the same time, Western specialists feel that the use of centralized aircraft and helicopter refueling systems does not rule out the widespread use of refueling trucks in the armed forces of NATO.

FOOTNOTE

1. For more detail on military pipelines of NATO in Central Europe see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE.--1986.--No 5.--pp 71-74. Ed.

12821
CSO: 1801/201

THE MILITARY BASE AT GIBRALTAR

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 72-74

[Article by Capt O. Kopytin: "The Gibraltar Military Base"]

[Text] The Strait of Gibraltar and the adjoining regions of the Atlantic Ocean and Mediterranean Sea are considered by the military and political leadership of NATO to be a most important zone in a military regard through which the principal maritime communications joining the Mediterranean countries with Western Europe and other continents pass. About 200 ships and vessels pass through it each day, carrying about a third of maritime shipping in the world.

The command of the bloc plans to move units for reinforcement and items of material and technical supply from the United States for the combined forces of NATO to the South European theater under extreme circumstances or upon the beginning of combat operations, and in the event of a rupture of maritime communications of NATO in the North Atlantic and for the combined forces of NATO in the Central European theater. The maintenance of continuous monitoring of the strait zone is, in the opinion of Western military specialists, one of the signal criteria for successfully waging combat operations in the South European theater and the Iberian Atlantic.

Also imparting significance to Gibraltar, judging from features in the foreign press, is the fact that one method of fighting enemy ships in operations far from their own bases is denying them passage through the strait. The closing of Gibraltar is envisaged to cut enemy surface ships and submarines off from their bases. According to data in the Western press, there exists a detailed plan for blockading the Strait of Gibraltar under the theoretical name of Fortress Height, the basic provisions of which are being worked out at NATO combined-forces exercises of the Test Height and Open Height variety. Particular attention in the course of them is being devoted to the fight against enemy submarines that could penetrate into the Mediterranean.

The length of the Strait of Gibraltar is 65 km [kilometers], its width is 14 to 22 km and the depth of the navigable channel is from 338 to 1,181 m [meters]. The Gibraltar peninsula (about 4.5 km long and up to 1.4 km wide), located on the southwest tip of the Pyrenees Peninsula at the entrance to the

Mediterranean and a well-known massive cliff rising 429 m, has decisive significance in maintaining surveillance of the strait. Its eastern side is steep, while the western one is more sloping. A neutral zone of about 500 m separates this British colony (legally Gibraltar has been under British rule since 1713) from Spain.

A British naval base in located in the northeast portion of the Gibraltar peninsula at which is located the command of the Gibraltar Naval Region of the British Navy and the command of the joint naval forces of NATO in the region.

A city and a port with an artificial harbor for vessels to moor is located in the western part of the peninsula facing the Bay of Algeciras. The harbor of Gibraltar (Fig. 2), protected by two jetties and a breakwater, has a depth of 8.2-14.6 m and is accessible to any ships right up to the multipurpose Forrestal-class aircraft carriers. The total length of all of the berths is over 7,000 m, including about 3,000 at the naval base. Two channels up to 185 m wide and 12-16 m deep lead to the harbor. It is divided into two parts--the North Pier and the South.

The North Pier (leased by the Ministry of Defense of Great Britain) has a total berthing length of over 1,200 m. The depth at the berths varies from 8.2 to 9.6 m. The trade and passenger ports are located here along with a container terminal and administrative buildings. The area of the North Pier also has six slips with a cargo capacity of 20-200 tons.

The length of the berthing line in the South Pier is 1,000 m, and the depth at the berths is 12.5 m. A repair drydock able to support the repair of combat vessels up to ASW aircraft carriers (of British construction) inclusive is located here. As noted in the foreign press, the ship-repair capabilities of the Gibraltar naval base was used extensively to repair ships that were damaged during the Anglo-Argentine conflict of 1982. Combat vessels can also be moored at the breakwater (the naval-base command leases the northern part of it for this purpose).

Surface and underground storehouses for artillery, mining, torpedo and other ordnance and combat equipment are located on the territory of the naval base along with warehouses for fuels and lubricants (total capacity is about 16,000 square meters), a naval hospital and four military settlements where about 10,000 people live. The communications and naval surface tracking center are also located here with about 140 support personnel. Large stores of various items of material and technical supply to support the base in the event of military operations are kept in tunnels and galleries in the cliff. There are also stores of drinking water there. The eastern incline of the cliff is equipped with storage tanks for collecting and holding rainwater. The base also has its own water-distilling installation.

In order to protect the naval base, three batteries of 234mm coastal artillery pieces and 40mm anti-aircraft installations are deployed on the summit of the Gibraltar cliff. Measures are currently underway to locate launch installations for Exocet anti-ship and Rapier anti-aircraft missiles on the peninsula.

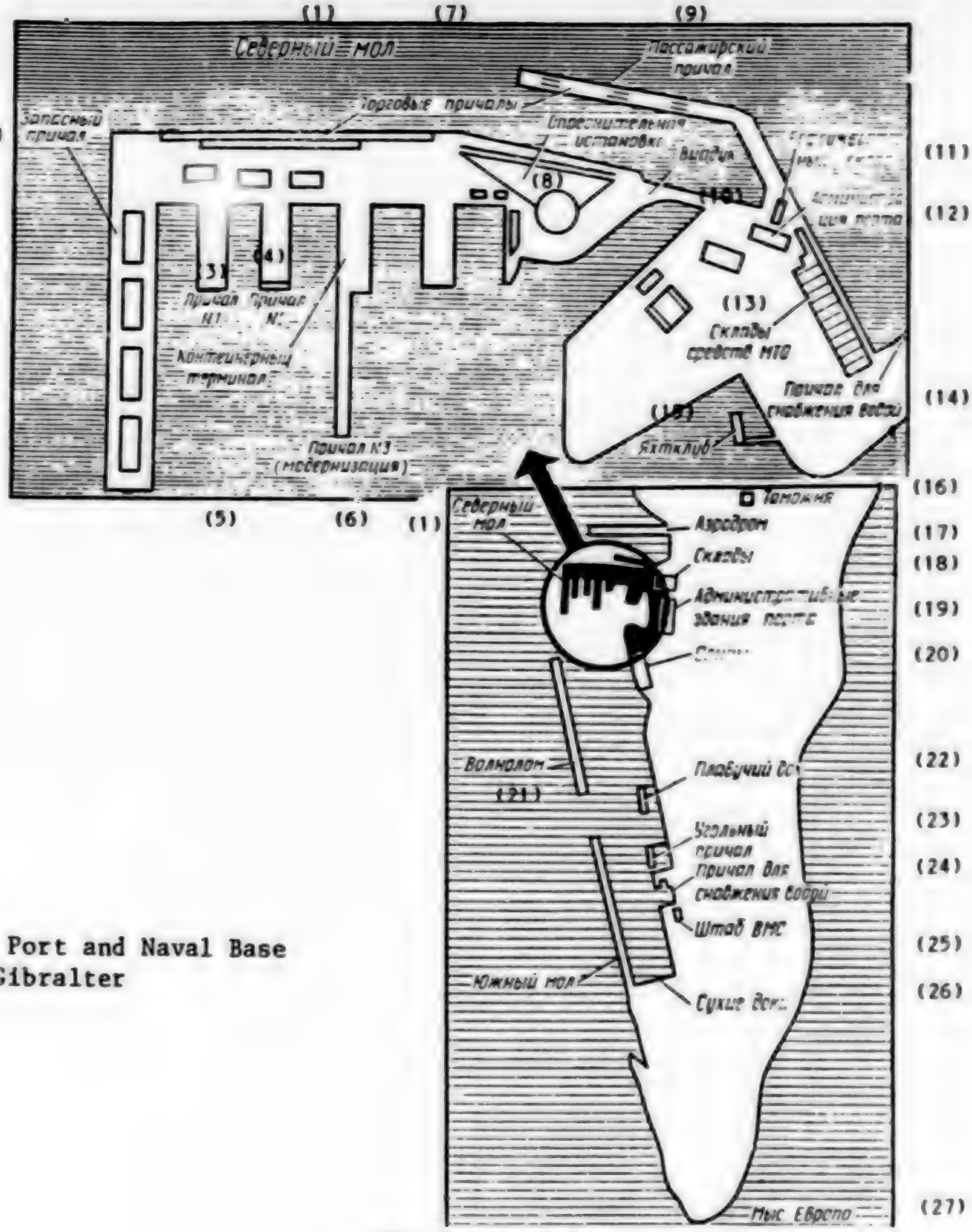

Figure 2: The Port and Naval Base of Gibralter

1--North pier
2--reserve berth
3--Berth No 1
4--Berth No 2
5--container terminal
6--Berth No 3 (modernization)
7--trade berths
8--distilling installation
9--passenger berth
10--viaduct
11--refrigerated warehouse
12--port administration
13--material and technical supply warehouses
14--water-supply berth
15--yacht club
16--customs
17--airfield
18--warehouses
19--port administrative buildings
20--slips
21--breakwater
22--floating dock
23--angled berth
24--water-supply berth
25--naval staff
26--drydocks
27--Cape Europa

There is an airfield 1 km from the port on the territory of the naval base that supports the basing of tactical, base patrol and transport aircraft. The runway of the airfield has an asphalt-concrete main surface that can accept aircraft of up to 60 tons.

Great Britain currently maintains about 2,000 servicemen on Gibraltar (Fig. 3), including a detached motorized infantry battalion, various engineering and support subunits and a subunit of Jaguar combat aircraft. As a rule, two or three frigates are stationed in the Gibraltar naval region in peacetime along with a submarine, base patrol aircraft, one or two reconnaissance aircraft and Sea Harrier fighters. This complement of forces is periodically replaced. At the start of war, as well as during NATO combined-forces exercises, additional manpower and equipment (combat ships and aircraft from the navies of other NATO countries--principally the United States and Spain) are transferred to the subordination of the commander of the Gibraltar naval region of the British Navy. As noted in the foreign press, the commander of the British armed forces has developed a plan for transferring units from the mother country to this base in case of need.

In peacetime the role of the base, according to data of the Western press, consists of supporting the repair and maintenance of the ships and vessels of the NATO countries and the replenishment of fuel supplies, as well as tracking the underwater, surface and aerial situation in the strait. In wartime, the forces and equipment of the Gibraltar naval base can be assigned to maintain surveillance over the Strait of Gibraltar, fight enemy submarines and ship task forces and defend maritime lines of communications (first and foremost meeting and escorting convoys from the Iberian Atlantic into the Mediterranean). Close interaction with the NATO combined-forces command in the Iberian Atlantic and the combined navies of NATO in the western region of the Mediterranean in organizing anti-submarine, anti-mining and anti-aircraft defense of the strait zone is also envisaged.

According to the evaluations of Western military specialists, up to 20 combat ships and auxiliary vessels and over 20 combat-patrol and tactical aircraft, along with helicopters, can be allotted for accomplishing the enumerated missions.

Gibraltar, as a place for the mooring and supply of ships, including submarines, with nuclear weapons on board for the member countries of the North Atlantic alliance, is a most important "way station" in the western part of the Mediterranean for monitoring the passage of vessels, as well as locating radio-reconnaissance stations. Great Britain, having put its base at the disposal of the NATO command, applies maximum effort to reinforce and re-equip it with the most up-to-date and improved technical equipment. The question of the status of the peninsula, however, is currently an open one with regard to the determination of Spain to continue to seek the decolonization of Gibraltar and the reluctance of Great Britain to cede this very important and strategic peninsula.

Bitter disputes regarding the status of Gibraltar have long taken place between the two countries, but recently this problem has become more acute in

connection with the entry of Spain into NATO and the appearance of additional reasons to shift sovereignty over Gibraltar to it as a result. In the course of preparing to enter the countries in the North Atlantic alliance, the Spanish government tried to link the problem of transferring sovereignty over Gibraltar with the possibility of membership in NATO. This did not turn out in reality, however. The military and political leadership of the bloc apparently still cannot find a satisfactory solution. The more so as, notwithstanding the positive results of a referendum on the membership of Spain in the bloc, powerful opposition remains within the country nonetheless, and furthermore it has still not entered the NATO military organization. It is also necessary to take into account the fact that having Ceuta (a Spanish enclave on the African coast of the strait) at its disposal and having obtained Gibraltar, Madrid would in fact be able to control the whole area of the strait individually.

The resolution of this issue is complicated still further in connection with the nuclear-free status of Spain. This signifies that in the event of a transfer of sovereignty over Gibraltar to it, the NATO command would be deprived of the opportunity of having nuclear weapons on the territory of Gibraltar and using them from there, which, in the opinion of Western European military specialists, would lead to a considerable reduction in the effectiveness of monitoring of the strait and the adjoining regions (the military and political leadership of Great Britain still does not give an unambiguous answer to the question of the presence of nuclear weapons on the peninsula).

The foreign press also notes that the NATO leaders will hardly go for a complication of relations with such an influential member of the bloc as Great Britain. And this would inevitably occur in the event of a resolution of the issue of the status of Gibraltar in favor of Spain. Furthermore, after its entry into NATO, Spain has been formally required to apply its armed forces to defend the British colony on its territory. That is, a situation has arisen that F. Gonzales, the prime minister of the Spanish government, has called a "historical paradox." Taking the extant situation into account, the leaders of the North Atlantic alliance will not give a guarantee to Spain, feeling that the problem should be considered only within the framework of bilateral negotiations between Spain and Great Britain. Western specialists assume that a formula for resolving the problem of Gibraltar can be found in the event of the entry of Spain into the military organization of the bloc. It is noted therein that the full entry of the country into NATO does not signify the automatic resolution of this issue overall.

Considering Gibraltar to be a most important strategic point that allows the monitoring of access to from the Mediterranean and its approaches to the Atlantic Ocean, the leaders of the bloc are making every effort to reinforce further the military bases located there and to equip them with modern technical equipment for surveillance with the goal of ensuring the more effective monitoring of the area of the strait. The United States is displaying a particular vested interest in this issue, and under the banner of NATO it is striving to transform Gibraltar into a base for the ships of its own Sixth Fleet. All of this testifies to the fact that the military and political leadership of the bloc, in spite of the will of the peoples of the

Pyrenees Peninsula and the Mediterranean countries, is continuing a policy of increasing tensions in the area, readying its armed forces to carry out its aggressive designs.

12821
CSO: 1801/201

MODERNIZATION OF PHANTOM AIRCRAFT IN THE FRG AIR FORCE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 75-76

[Article by Col V. Sibiryakov: "Modernization of Phantom Aircraft in the FRG Air Force"]

[Text] Judging by reports in the foreign press, West Germany has begun work on modernizing the F-4F Phantom-2 multipurpose tactical fighters in their air force. Planned first is the improvement of the F-4F aircraft in the 35th Fighter-Bomber Air Squadron (Pferdfeld Airbase, two squadrons of 15 aircraft each) and the 36th (Hopsten, two squadrons of 15 aircraft each) that are part of the 1st and 3rd Air Support Divisions respectively.

More up-to-date electronic equipment, including inertial navigational systems with laser gyroscopes, high-speed digital computers, a new range finder etc., will be installed on these aircraft. Refinement of the outer suspension racks is also projected so that the aircraft can carry practically all existing and projected types of air-to-ground weapons. Work is planned at the same time to improve individual units of the fuselage and on-board systems.

Flight testing of the first modernized F-4F Phantom-2 fighter-bomber is planned to start at the end of 1987. As reported in the foreign press, the refinements to the F-4F aircraft in the aforementioned squadrons should be completed in the first quarter of 1989. After that, work will begin on modernizing the F-4F aircraft in the 71st (Witmundhafen, two squadrons of 15 aircraft each) and 74th (Neuburg, two squadrons of 15) Squadrons, part of the 4th and 2nd Anti-Aircraft Defense Air Divisions respectively.

New on-board radar, a modern cockpit information-display system and other equipment will be installed in the fighters. The refinement of the weapons system with a regard for the fact that the new American AIM-120A air-to-air missile may be employed on the aircraft aside from the missiles currently used is envisaged. Flight testing of the new modernized F-4F fighter is planned to begin in 1988.

In evaluating the modernization program for the F-4F fighters, West German specialists note that the completion of this work will not only permit the operational life of the aircraft to be extended to the end of the 1990s, but will also substantially raise their combat capabilities.

12821
CSO: 1801/201

NATO SCIENTIFIC RESEARCH VESSEL ALLIANCE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 5, May 87 (signed to press 4 May 87) pp 76-77

[Article by Capt 1st Rank Yu. Shorin: "The NATO Scientific Research Vessel Alliance"]

[Text] A scientific research vessel that has received the name of Alliance is being completed at a wharf of the Italian shipbuilding firm of Fincantieri in the city of Spezia. It is intended for scientific research work in the interests of improving fixed, shipborne and airborne hydro-acoustic apparatus, as well as reducing the acoustic field of the surface ships and submarines of the NATO countries. The navigational range of the vessel is unlimited, and its hull has icebreaking reinforcement.

In the summer of 1987, after completion of the vessel, it is planned to transfer it to the NATO Atlantic ASW scientific center in the city of Spezia. Its port of registry will be Glasgow (Great Britain). The vessel will sail under the flag of the West German trade fleet, while the crew will be made up of servicemen in the following manner: the captain is from West Germany, the officers from Great Britain and the sailors from Italy. The scientific work on board will be carried out by about 20 scientists from various NATO countries.

The vessel is being equipped by firms of seven countries--Italian ones put in the two B230 diesels with 1,500 kilowatts of power each, West German firms put in the main generators, main propulsion motors and the automatic control and monitoring systems, Americans did the satellite navigation system and most of the scientific apparatus, Norwegians installed two auxiliary gas-turbine engines with 1,600 kilowatts of power, Dutch firms supplied the two five-bladed screws of 3.35 meters in diameter, British firms did the life-saving equipment and the Swiss contributed a sea-water distilling installation. The vessel cost 37 million dollars.

The requirements for a maximum reduction in the intrinsic noise level, electromagnetic field and the possibility of creating a regimen of "absolute quiet" in conducting the research were taken into account when designing and building the vessel. All of the equipment was installed on anti-vibration mountings and special dampers. Sound-absorbing coatings and sound-insulated

coverings were widely employed. The vessel is saturated with modern computer equipment to control it and conduct scientific operations.

With the entry into service of the Alliance, the militarist NATO bloc will receive yet another effective tool for the development of new and the improvement of existing means of fighting submarines.

12821
CSO: 1801/201

- END -

END OF FICHE

DATE FILMED

3 Nov- 87